Perfect Wireless Experience
完美无线体验

# H330S Hardware User Manual

Version：V1.1.6

Date：2015.11.17

## Applicability Type

| No. | Type | Note |
|---|---|---|
| 1 | H330S-Q50-00 | |
| 2 | H330S-Q30-00 | |
| 3 | H330S-A30-00 | |
| 4 | H330S-A50-00 | |
| 5 | H330S-A30-20 | |
| 6 | H330S-A50-20 | 仅有 MiniPCIe 型号 |
| 7 | H330S-Q50-20 | 仅有 MiniPCIe 型号 |

The difference of H330S series wireless module as listed below:

| Model No. | GSM/GPRS/EDGE Band(MHz) | WCDMA Band(MHz) | Voice | HSDPA (Mbps) | HSUPA (Mbps) |
|---|---|---|---|---|---|
| H330S-Q50-00 | 850/900/1800/1900 | 850/900/1900/2100 | Y | 21 | 5.76 |
| H330S-Q30-00 | 850/900/1800/1900 | 850/900/1900/2100 | Y | 7.2 | 5.76 |
| H330S-A30-00 | 900/1800 | 900/2100 | Y | 7.2 | 5.76 |
| H330S-A50-00 | 900/1800 | 900/2100 | Y | 21 | 5.76 |
| H330S-A30-20 | 900/1800 | 900/2100 | N | 7.2 | 5.76 |
| H330S-A50-20 | 900/1800 | 900/2100 | N | 21 | 5.76 |
| H330S-Q50-20 | 850/900/1800/1900 | 850/900/1900/2100 | N | 21 | 5.76 |

## Copyright



## Attention

The document is subject to update from time to time owing to the product version upgrade or other reasons. Unless otherwise specified, the document only serves as the user guide. All the statements, information and suggestions contained in the document do not constitute any explicit or implicit guarantee.

## Trademark

The trademark is registered and owned by Fibocom Wireless Inc.

## Versions

| Version | Date | Remarks |
|---|---|---|
| V1.0.0 | 2012-05-30 | Initial Version |
| V1.0.1 | 2012-07-06 | Update product model No. |
| V1.0.2 | 2012-08-08 | Update Mechanical, PCB Design, Pin Out |
| V1.0.3 | 2012-11-20 | Modify Pin description and incorrect specifications |
| V1.0.4 | 2013-01-09 | Update the name of the document; add reliability features |
| V1.0.5 | 2013-01-24 | Update the document name |
| V1.0.6 | 2013-05-02 | Update the name of the manual<br>Add UART_R1<br>Add model comparisons<br>Update the current specification |
| V1.0.7 | 2013-07-01 | Add two models<br>Add comparison on voice |
| V1.0.8 | 2013-09-13 | SMI is updated to a output pin; update section 5.4.1;<br>Update Figure5-2, Figure5-4; |

| | | |
|---|---|---|
| | | Update description of RTC<br>Add section 5.8.3<br>Update section 5.3.2.3 WAKE_UP |
| V1.0.9 | 2013-10-12 | Update description for ADC, POWER OFF and RESET. |
| V1.1.0 | 2013-12-18 | Modify I2S signal Pin # in section 5.8.<br>Add default status and idle status of GPIO<br>Update downstream rate and upstream rate of GPRS<br>Update the maximum operating voltage to 4.2V |
| V1.1.1 | 2015-01-30 | Update the range of operating temperature. |
| V1.1.2 | 2015-04-21 | Add the description of “Top View” in PCB Layout |
| V1.1.3 | 2015-05-10 | Update the description of copyright and attention.<br>Update the translation of the whole document. |
| V1.1.4 | 2015-07-27 | Update the info of H330S and the logo. |
| V1.1.5 | 2015-09-22 | Update the 12C and 12S description of H330S-XXX-20 |
| V1.1.6 | 2015-11-17 | Update the maximum operating voltage to 4.2V |

# Contents

# 1 Foreword

## 1.1 Introduction

The document describes the electrical characteristics, RF performance, dimensions and application environment, etc. of H330S series wireless modules. With the assistance of the document and other instructions, developers can quickly understand the performance of H330S series wireless modules and develop products.

## 1.2 Reference Standards

The design of the product complies with the following standards:

- 3GPP TS 27.007 -v6.9.0: AT command set for User Equipment (UE)
- 3GPP TS 27.005 -v6.0.1: Use of Data Terminal Equipment -Data Circuit terminating Equipment (DTE-DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)
- 3GPP TS 23.040 -v6.9.0: Technical realization of Short Message Service (SMS)
- 3GPP TS 24.011 -v6.1.0: Point- to - Point (PP) Short Message Service (SMS) support on mobile radio interface
- 3GPP TS 27.010 -v6.0.0: Terminal Equipment to User Equipment (TE-UE) multiplexer protocol
- 3GPP TS 27.060 -v6.0.0: Packet domain; Mobile Station (MS) supporting Packet Switched services
- 3GPP TS 25.304-v6.10.0: User Equipment (UE) procedures in idle mode and procedures for cell reselection in connected mode
- 3GPP TS 25.308 -v6.4.0: High Speed Downlink Packet Access (HSDPA); Overall description; Stage 2
- 3GPP TS 25.309 -v6.6.0: FDD enhanced uplink; Overall description; Stage 2
- 3GPP TS 23.038 -v6.1.0: Alphabets and language - specific information
- 3GPP TS 21.111 -v6.3.0: USIM and IC card requirements
- 3GPP TS 31.111 -v6.11.0 "USIM Application Toolkit (USAT)"
- 3GPP TS 45.002 -v6.12.0: Multiplexing and multiple access on the radio path
- 3GPP TS 51.014 -v4.5.0: Specification of the SIM Application Toolkit for the Subscriber Identity Module - Mobile Equipment (SIM-ME) interface
- 3GPP TS 51.010 -1 -v6.7.0: Mobile Station (MS) conformance specification; Part 1: Conformance specification
- 3GPP TS 22.004 -v6.0.0: General on supplementary services
- 3GPP TS 23.090 -v6.1.0: Unstructured Supplementary Service Data (USSD); Stage 2
- 3GPP TS 24.008 v6.19, Mobile radio interface Layer 3 specification;

# 2 Product Overview

## 2.1 Description

H330S series modules are 3G wireless modules with high integration density, supporting GSM/GPRS/EDGE and UMTS/HSDPA/HSUPA/HSPA+.

## 2.2 Specifications

| **Specifications** | |
|---|---|
| **Operating Frequency Range** | UMTS (WCDMA/FDD): 850/900/1900/2100 MHz or 900/2100MHz |
| | GSM/GPRS/EDGE: 850/900/1800/1900 MHz or 900/1800MHz |
| **Data Rate** | UMTS/HSDPA/HSUPA 3GPP release 7 |
| | HSUPA 5.76Mbps (Cat 6) |
| | HSDPA 21Mbps (Cat 14) or 7.2Mbps (Cat 8) |
| | GSM 3GPP release 7 |
| | EDGE (E-GPRS) multi-slot class 33 (296kbps DL, 236.8kbps UL) |
| | GPRS multi-slot class 33 (107kbps DL, 85.6kbps UL) |
| **Physical Characteristics** | Dimension: 33.8 x 27.8 x 2.45mm |
| | Interface: LGA |
| | Weight: <5.5 grams |
| **Environment** | Normal operating Temperature: -30℃ ~ +75℃<br>Restricted operating temperature①: -40℃ ~ +85℃ |
| | Storage Temperature: -40℃ ~ +85℃ |
| **Performance** | |
| **Operating Voltage** | Voltage: 3.3V ~ 4.2V Normal: 3.8V |
| **Current Consumption (Typical Value)** | 2mA (Sleep Mode) |
| | 3G Idle: 13mA |
| | 3G Talk: 500mA |
| | 2G Talk: 260mA (GSM PCL5) |

| | |
|---|---|
| **Tx Power**<br>**(Typical Value)** | Class 4 (2W) : 850/900 MHz, GSM |
| | Class 1 (1W) : 1800/1900 MHz, GSM |
| | Class E2 (0.5W) : 850/900 MHz, EDGE |
| | Class E2 (0.4W) : 1800/1900 MHz, EDGE |
| | Class 3 (0.25W) : 850/900/1900/2100 MHz, WCDMA |
| **Rx Sensitivity**<br>**(Typical Value)** | UMTS/HSPA: -109dBm |
| | GSM: -108dBm |
| **Interfaces** | |
| **Rf Interface** | Main Antenna |
| **Function Interface** | 1 x USB 2.0 |
| | 2 x UART |
| | MUX Over UART1 |
| | Multiple Profiles over USB |
| | SPI Support (Not supported yet) |
| | I2C Support② |
| | I2S Support② |
| | PCM, HSIC, GPIO, A/D, RTC |
| **Data Features** | |
| **Protocol Stack** | Embedded TCP/IP and UDP/IP protocol stack |
| **EDGE** | Multi-slot class 33(5 Down; 4 Up; 6 Total) |
| | Coding Scheme MCS1~9 |
| **GPRS** | Multi-slot class 33(5 Down; 4 Up; 6 Total) |
| | Coding Scheme CS1~4 |
| **CSD** | UMTS(14.4kbps), GSM(9.6kbps) |
| **USSD** | Support |
| **SMS** | MO / MT Text and PDU modes |

| | |
|---|---|
| | Cell broadcast |
| **Audio** | Analog Audio and Digital Audio② |
| | Voice coders: EFR/HR/FR/AMR |
| **Audio Frequency Control** | Gain Control, Echo Cancellation, Noise Suppression, Sidetone |
| **Character Set** | IRA |
| | GSM |
| | UCS2 |
| | HEX |
| **AT Commands** | FIBOCOM proprietary AT commands |
| | GSM 07.05 |
| | GSM 07.07 |
| **Accessories** | Firmware Loader Tool over USB/UART |
| | User Manual |
| | Developer Kit |

**Note：**

①：For the temperature is out of the normal temperature range: -30℃ ~ +75, some indexes may slightly deviate from the related 3GPP codes.

②：H330S-XXX-20 serials module dose not support I2C/I2S/Analog Audio and Digital Audio.

# 2.3 Appearance

The product appearance of H330S series wireless module is shown as below:

Top view:


Figure 2- 1 Top View

Bottom view:

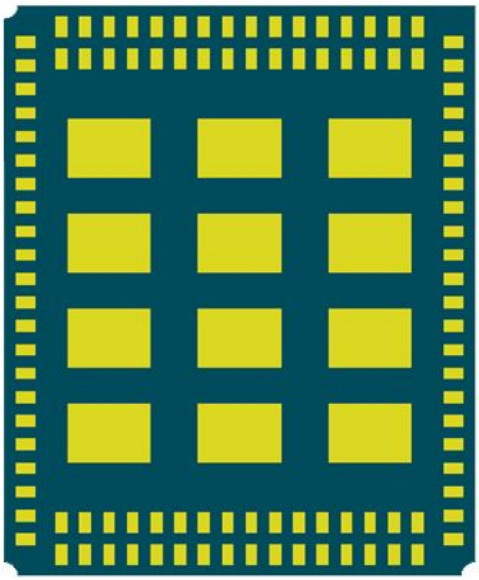


Figure 2- 2 Bottom View

# 3 Structure

## 3.1 Dimension Diagram of Structure

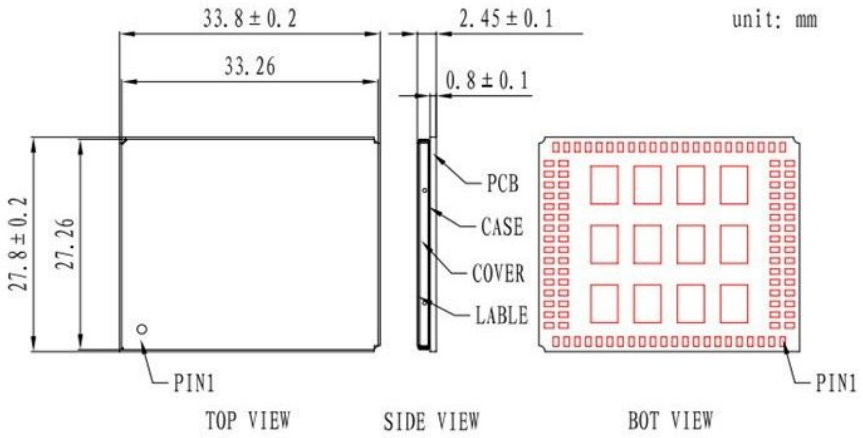



Figure 3- 1 Dimension Diagram of Structure

## 3.2 PCB Layout Design

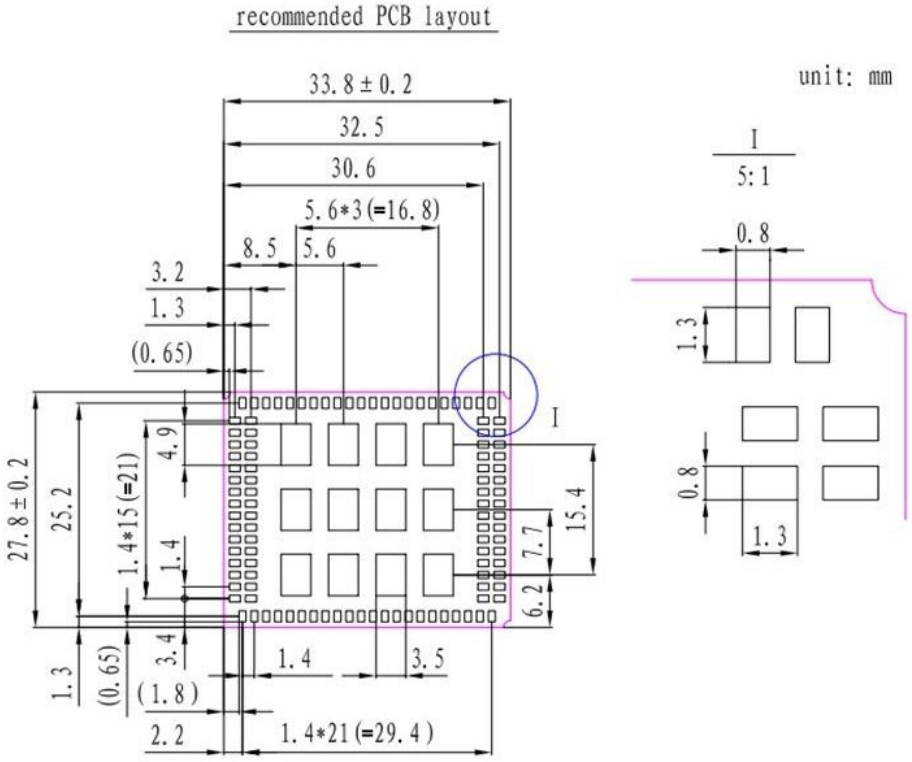



Figure 3- 2 Recommended PCB Layout

(Top View)

# 4 Hardware Introduction

## 4.1 Hardware Block Diagram

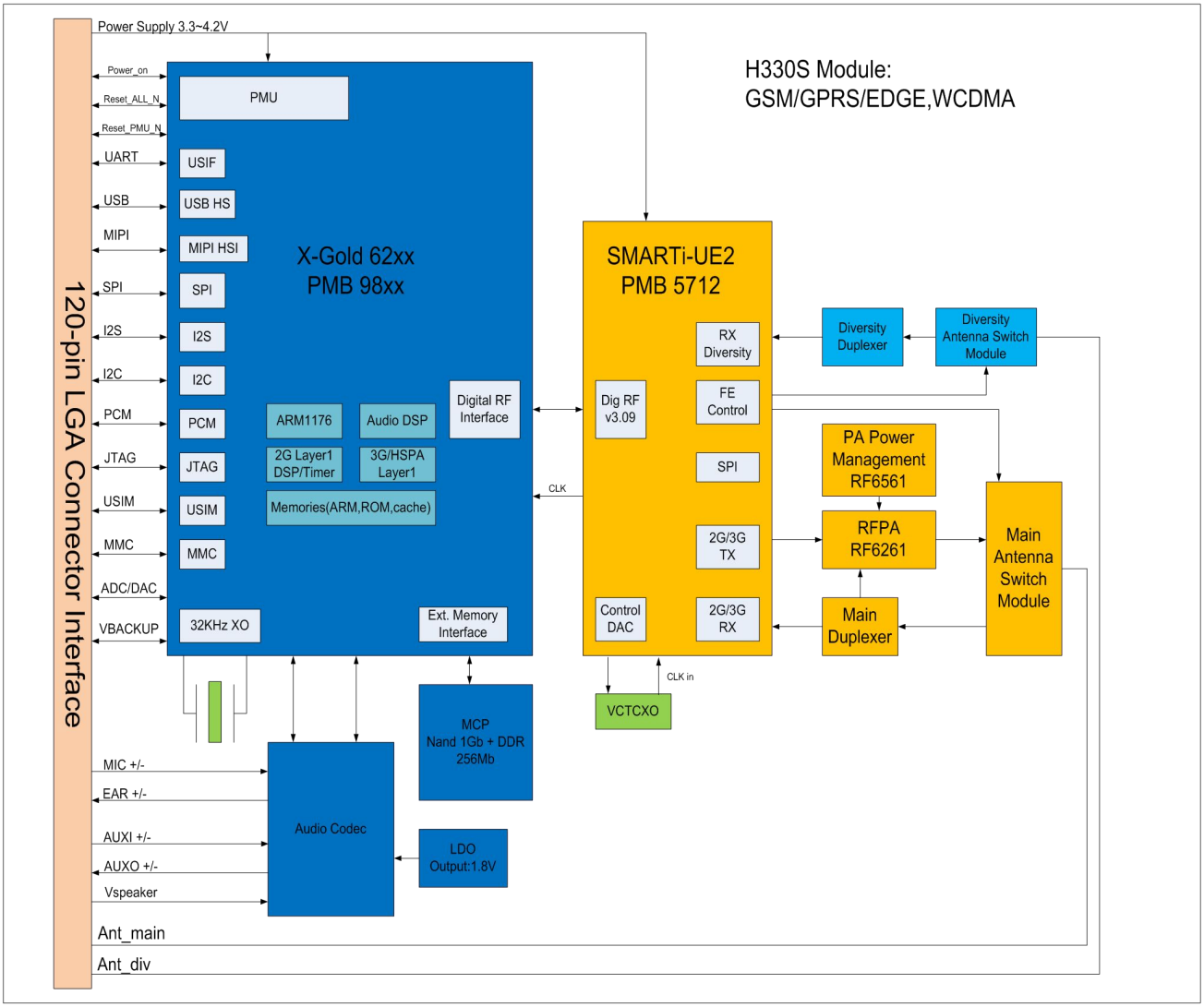
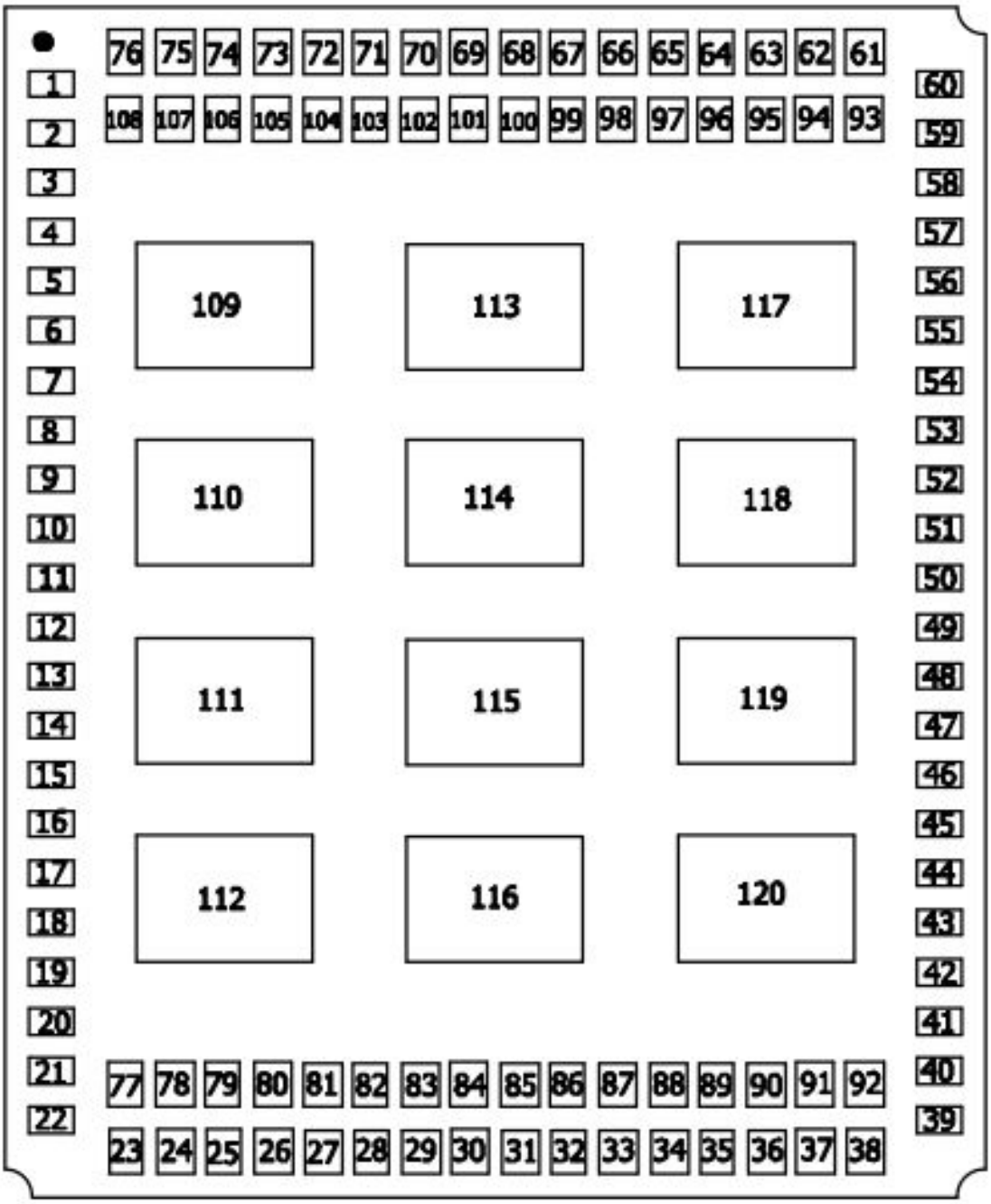



Figure 4- 1 Block Diagram

# 4.2 Pin Definition

## 4.2.1 Pin Map




TOP (View)

Figure 4-2 Pin Diagram

## 4.2.2 Description of Pins

The logic signal lever of H330S series is 1.8V. Pins of H330S series are described in the table below:

| Pin # | Pin Name | I/O | Reset Value | Idle Value | Description |
|---|---|---|---|---|---|
| **Power Supply** | | | | | |
| 59 | VBAT | I | | | Main power supply, voltage range: 3.3V ~ 4.2V. |
| 60 | VBAT | I | | | |
| 61 | VBAT | I | | | |
| 62 | VBAT | I | | | |
| 64 | VPA | O | | | Test pin for power supply of RF power amplifier .Idle state in actual use. |
| 1 | VTRX | O | | | Test pin for transceiver power supply . Idle state in actual use |
| 46 | VIO | O | | | 1.8V voltage output inside the modules. |
| 47 | VRTC | I/O | | | Backup battery input/output. |
| **Power ON/OFF Signal** | | | | | |
| 48 | POWER_OFF | I | PU | PU | Power off control signal, internal 4.7K pull-up resistor |
| 49 | POWER_ON | I | PU | PU | Power on control signal, internal 200K pull-up resistor |
| **Reset Signal** | | | | | |
| 77 | RESET_ALL_N | I | PU | PU | External reset signal input, internal 200K pull-up resistor |
| **USIM Interface** | | | | | |
| 4 | USIM_CD | I | PU | PU | Insert USIM card to test; active low; Internal 390K pull-up resistor. |
| 5 | USIM_VCC | O | | | USIM card power supply: 1.8V or 3.0V |
| 6 | USIM_RST | O | PP | PP | USIM card reset signal. |
| 7 | USIM_CLK | O | PP | PP | USIM card clock signal. |
| 8 | USIM_DATA | I/O | PU | PU | USIM card data signal, internal 4.7K pull-up resistor. |

| Pin # | Pin Name | I/O | Reset Value | Idle Value | Description |
|---|---|---|---|---|---|
| **High Speed SIM Interface** | | | | | |
| 9 | USIM_D+ | | | | High speed SIM card USB signal + (Temporarily not supported) |
| 10 | USIM_D- | | | | High speed SIM card USB signal - (Temporarily not supported) |
| **Audio Interface** | | | | | |
| 13 | AUXO+ | O | | | Speaker output signal + |
| 14 | AUXO- | O | | | Speaker output signal - |
| 15 | EAR- | O | | | Earphone signal output - |
| 16 | EAR+ | O | | | Earphone signal output + |
| 17 | MIC+ | I | | | Main MIC input signal + |
| 18 | MIC- | I | | | Main MIC input signal - |
| 19 | AUXI- | I | | | Auxiliary MIC input signal - |
| 20 | AUXI+ | I | | | Auxiliary MIC input signal + |
| 21 | AGND | GND | | | Analog GND |
| 22 | VSPK | I | | | Power supply input for the internal power amplifier of audio codec chip, Advise to connect VBAT. |
| **I²S** | | | | | |
| 11 | I2S2_CLK1 | O | PD | PD | I2S2 serial clock SCLK1 |
| 24 | I2S2_CLK0 | O | T | T | I2S2 serial clock SCLK0 (Default: CLK0) |
| 25 | I2S2_WA0 | O | T | T | I2S2 field selection signal |
| 26 | I2S2_TX | O | T | T | I2S2 serial data output |
| 27 | I2S2_RX | I | T | T | I2S2 serial data input③ |
| **USB** | | | | | |
| 31 | USB_DP | I/O | | | USB data signal+ |
| 32 | USB_DM | I/O | | | USB data signal- |
| 33 | USB_ID | — | | | USB ID signal |

| Pin # | Pin Name | I/O | Reset Value | Idle Value | Description |
|---|---|---|---|---|---|
| 34 | VUSB | I | | | USB Power Input |
| 92 | USB_TEST | — | | | USB TEST signal |
| **I²C** | | | | | |
| 28 | I2C_SDA | I/O | PU | PU | I2C data signal line, Internal 1K pull-up resistor③ |
| 29 | I2C_SCL | O | PU | PU | I2C clock signal line, Internal 1K pull-up resistor. |
| **UART1** | | | | | |
| 35 | UART1_RI | O | L | L | UART1 Ring Indicator |
| 36 | UART1_DSR | I | T | T | UART1 DTE Ready |
| 37 | UART1_DTR | O | H | H | UART1 DCE Ready |
| 38 | UART1_DCD | O | L | L | UART1 Carrier Detect |
| 39 | UART1_CTS | I | PU | PU | UART1 Clear To Send |
| 40 | UART1_RTS | O | L | L | UART1 Request To Send |
| 41 | UART1_TXD | O | PP | PP | UART1 Transmitted Data |
| 42 | UART1_RXD | I | PU | PU | UART1 Received Data |
| **UART2** | | | | | |
| 45 | UART2_TXD | O | PP | PP | UART2 Transmitted Data |
| 44 | UART2_RXD | I | PU | PU | UART2 Received Data |
| **ADC** | | | | | |
| 50 | ADC2 | I | | | ADC2, input voltage range:0~1.2V |
| 51 | ADC1 | I | | | ADC1, input voltage range:0~1.2V |
| **EINT** | | | | | |
| 56 | WAKE_UP | I | PU | PU | Interrupt of external wake-up, active low. |
| 57 | EINT2 | I | PU | PU | External interrupt, active low. |
| **USB HSIC** | | | | | |
| 90 | HSIC_USB_DATA | | | | HSIC USB data signal line (not supported) |

| Pin # | Pin Name | I/O | Reset Value | Idle Value | Description |
|---|---|---|---|---|---|
| 91 | HSIC_USB_STRB | | | | HSIC USB pulse signal line (not supported) |
| **Antenna** | | | | | |
| 67 | ANT_MAIN | I | | | Main antenna interface,impedance requirement: 50 ohm. |
| 71 | ANT_DIV | I | | | Only supported by some models |
| **Others** | | | | | |
| 3 | DSP_AUDIO_IN1 | O | H | H | GPIO . Used for HSIC IPC in special software versions |
| 54 | CLKOUT0 | O | PP | PP | Digital audio clock output |
| 89 | SMI | O | L | | Sleep Mode Indicator |
| 86 | LPG | O | | | Status indicator |
| **NC** | | | | | |
| 23 | NC | | | | |
| 55 | NC | | | | |
| 52 | NC | | | | |
| 53 | NC | | | | |
| 73 | NC | | | | |
| 74 | NC | | | | |
| 75 | NC | | | | |
| 76 | NC | | | | |
| 78 | NC | | | | |
| 79 | NC | | | | |
| 80 | NC | | | | |
| 81 | NC | | | | |
| 82 | NC | | | | |
| 83 | NC | | | | |
| 84 | NC | | | | |

| Pin # | Pin Name | I/O | Reset Value | Idle Value | Description |
|---|---|---|---|---|---|
| 85 | NC | | | | |
| 87 | NC | | | | |
| 88 | NC | | | | |
| 94 | NC | | | | |
| 95 | NC | | | | |
| 96 | NC | | | | |
| 101 | NC | | | | |
| 105 | NC | | | | |
| 106 | NC | | | | |
| 107 | NC | | | | |
| 108 | NC | | | | |
| **GND** | | | | | |
| 2 | GND | | | | |
| 12 | GND | | | | |
| 30 | GND | | | | |
| 43 | GND | | | | |
| 58 | GND | | | | |
| 63 | GND | | | | |
| 65 | GND | | | | |
| 66 | GND | | | | |
| 68 | GND | | | | |
| 69 | GND | | | | |
| 70 | GND | | | | |
| 72 | GND | | | | |
| 93 | GND | | | | |
| 97 | GND | | | | |
| 98 | GND | | | | |
| 99 | GND | | | | |

| Pin # | Pin Name | I/O | Reset Value | Idle Value | Description |
|---|---|---|---|---|---|
| 100 | GND | | | | |
| 102 | GND | | | | |
| 103 | GND | | | | |
| 104 | GND | | | | |
| 109 | GND | | | | |
| 110 | GND | | | | |
| 111 | GND | | | | |
| 112 | GND | | | | |
| 113 | GND | | | | |
| 114 | GND | | | | |
| 115 | GND | | | | |
| 116 | GND | | | | |
| 117 | GND | | | | |
| 118 | GND | | | | |
| 119 | GND | | | | |
| 120 | GND | | | | |

H：High Voltage Level

L：Low Voltage Level

PD：Pull-Down

PU：Pull-Up

T：Tristate

OD：Open Drain

PP：Push-Pull

**Note：**

③: the pin28(I2C_SDA) and pin27(I2S2_RX) of the H330S-XXX-20 series is floating, please don not use.

# 5 Hardware Interface

## 5.1 Power Interface

### 5.1.1 Power Supply

H330S modules require 3.3V~4.2V direct current power supply, which can provide the maximum GSM emission current of 2A.

Input power supply requirements:

| Parameter | Minimum Value | Recommended Value | Maximum Value | Unit |
|---|---|---|---|---|
| VBAT | 3.3 | 3.8 | 4.2 | V |

**Points for attention in design:**

1. Supply voltage fluctuation shall be lower than 300mV.

2. Minimum supply voltage drop shall be higher than 3.3V.

Filter capacitor of supply circuit is designed as follows:

| Recommended capacitor | Application | Description |
|---|---|---|
| 1000uF | Supply capacitance | Reduce power-supply fluctuation during phone call. The capacitance value bigger is better |
| 10nF, 100nF | Digital signal noise | Filter the interference caused by clock and digital signals |
| 8.2pF, 10pF | 1800/1900/2100 MHz | Filter RF interference |
| 33pF, 39pF | 850/900 MHz | Filter RF interference |

### 5.1.2 Power Consumption

| Parameter | Description | Condition | | Typical Value | Unit |
|---|---|---|---|---|---|
| $I_{off}$ | RTC mode | | | 60 | uA |
| $I_{idle}$ | Idle mode | GSM | | 13 | mA |
| | | WCDMA | | 13 | mA |
| $I_{sleep}$ | Low power | DRX | 2 | 2 | mA |

| Parameter | Description | Condition | | Typical Value | Unit |
|---|---|---|---|---|---|
| | mode | DRX | 5 | 2 | |
| | | DRX | 9 | 2 | |
| $I_{GSM-RMS}$ | GSM voice -<br>1 TX slot<br>1 Rx slot | GSM850 PCL | 5 | 230 | mA |
| | | | 10 | 80 | |
| | | | 15 | 50 | |
| | | | 19 | 46 | |
| | | EGSM900 PCL | 5 | 240 | |
| | | | 10 | 83 | |
| | | | 15 | 50 | |
| | | | 19 | 47 | |
| | | DCS1800 PCL | 0 | 156 | |
| | | | 5 | 71 | |
| | | | 10 | 49 | |
| | | | 15 | 46 | |
| | | PCS1900 PCL | 0 | 165 | |
| | | | 5 | 70 | |
| | | | 10 | 50 | |
| | | | 15 | 46 | |
| $I_{GPRS-RMS}$ | GPRS Class<br>33 -<br>4 TX slot<br>1 Rx slot | GSM850 PCL | 5 | 355 | mA |
| | | | 10 | 216 | |
| | | | 15 | 108 | |
| | | | 19 | 94 | |
| | | EGSM900 PCL | 5 | 383 | |
| | | | 10 | 225 | |
| | | | 15 | 108 | |
| | | | 19 | 94 | |
| | | DCS1800 PCL | 0 | 259 | |
| | | | 5 | 180 | |

| Parameter | Description | Condition | | Typical Value | Unit |
|---|---|---|---|---|---|
| | | | 10 | 103 | |
| | | | 15 | 95 | |
| | | PCS1900 PCL | 0 | 266 | |
| | | | 5 | 182 | |
| | | | 10 | 103 | |
| | | | 15 | 95 | |
| $I_{EGPRS-RMS}$ | EGPRS Class 33 - 4 TX slot 1 Rx slot | GSM850 PCL | 8 | 522 | mA |
| | | | 14 | 145 | |
| | | | 19 | 95 | |
| | | EGSM900 PCL | 8 | 522 | |
| | | | 14 | 150 | |
| | | | 19 | 95 | |
| | | DCS1800 PCL | 2 | 484 | |
| | | | 9 | 117 | |
| | | | 15 | 103 | |
| | | PCS1900 PCL | 2 | 493 | |
| | | | 9 | 118 | |
| | | | 15 | 103 | |
| $I_{GSM-MAX}$ | Peak current During TX slot | GSM850 PCL | 5 | 1655 | mA |
| | | | 10 | 473 | |
| | | | 15 | 193 | |
| | | | 19 | 148 | |
| | | EGSM900 PCL | 5 | 1715 | |
| | | | 10 | 536 | |
| | | | 15 | 208 | |
| | | | 19 | 147 | |
| | | DCS1800 PCL | 0 | 1050 | |
| | | | 5 | 464 | |

| Parameter | Description | Condition | | Typical Value | Unit |
|---|---|---|---|---|---|
| | | | 10 | 199 | |
| | | | 15 | 138 | |
| | | PCS1900 PCL | 0 | 1100 | |
| | | | 5 | 489 | |
| | | | 10 | 203 | |
| | | | 15 | 139 | |
| $I_{WCDMA-RMS}$ | WCDMA | Band5 (850) | 24dBm | 387 | mA |
| | | | 0dBm | 127 | |
| | | | -24dBm | 121 | |
| | | | -50dBm | 119 | |
| | | Band2 (1900) | 24dBm | 439 | |
| | | | 0dBm | 130 | |
| | | | -24dBm | 123 | |
| | | | -50dBm | 121 | |
| | | Band1 (2100) | 24dBm | 475 | |
| | | | 0dBm | 131 | |
| | | | -24dBm | 121 | |
| | | | -50dBm | 119 | |
| | | Band8 (900) | 24dBm | 384 | |
| | | | 0dBm | 127 | |
| | | | -24dBm | 123 | |
| | | | -50dBm | 121 | |

### 5.1.3 VIO

As the power supply for the digital circuit inside the module, VIO can be used as the status indicator for the module.

VIO can be used as the reference level of the module's digital signals.

| Parameter | Minimum Value | Recommended Value | Maximum Value | Unit |
|---|---|---|---|---|
| VIO in operation | 1.773 | 1.8 | 1.827 | V |

### 5.1.4 VRTC

VRTC is the power supply of the RTC inside the module, and it can be used as the backup power signal as well.

| Parameters | Minimum Value | Recommended Value | Maximum Value | Unit |
|---|---|---|---|---|
| VRTC output voltage | 1.71 | 1.8 | 1.89 | V |
| VRTC input voltage (RTC is in normal) | 0.5 | 1.8 | 1.89 | V |
| VRTC input current (RTC is in normal) | | | 1.0 | uA |

The reference design of VRTC circuit is as follows:

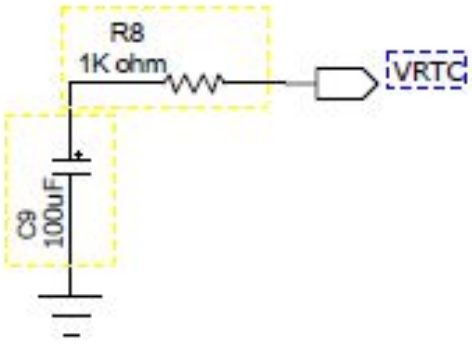



Figure 5- 1 VRTC Reference Design

**Note:**

- R8 is a current-limiting resistor, used to ensure the VRTC module works properly, free from being affected by peripheral circuits. R8≥1k ohm
- VRTC power consumption current<1uA
- The value of C9 will affect the retaining time of RTC after VBAT powers off. The retaining time of RTC can be roughly calculated by the following formula:

T= (1.8-0.5)*C/1=1.3C, unit: second. Namely, if the value of C9 is 100uF, the retaining time of RTC will be around 130s.

# 5.2 Power on/off and Reset Signal

## 5.2.1 Pin Definition of Power on/off Control Signal

H330S wireless modules provide three control signals to start up, shut down, and reset the modules.

Pins definition as listed below :

| Pin# | Pin Name | Electrical Level | Description |
|---|---|---|---|
| 48 | POWER_OFF | CMOS 1.8V | Power off signal |
| 49 | POWER_ON | CMOS 1.8V | Power on signal |
| 77 | RESET_ALL_N | CMOS 1.8V | External reset signal input |

## 5.2.2 Power on Signal

After the module is connected to the power supply, the user can start up the module by setting low POWER_ON signal low.

Timing sequence requirement of the startup pulse:

| Parameter | Condition | Minimum Value | Typical Value | Maximum Value | Unit |
|---|---|---|---|---|---|
| Pulse Width | | 100 | 300 | 3000 | ms |

The timing sequence control is shown in the diagram below:

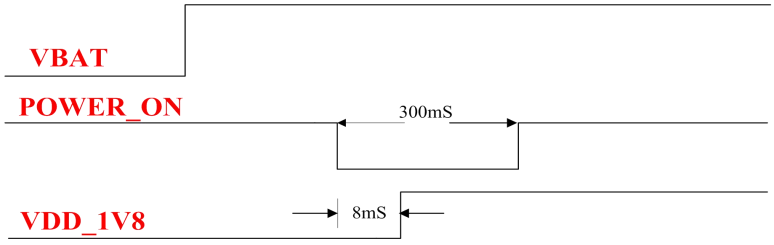



Figure 5- 2 Timing Control

The recommended design of POWER_ON signal is as follows:

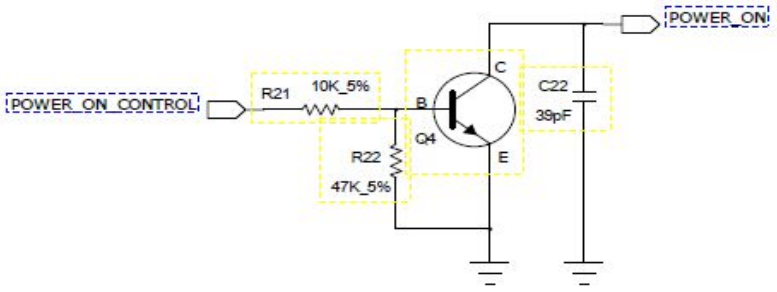



Figure 5- 3 POWER_ON Reference Design

## 5.2.3 Power off Signal

When setting POWER_OFF signal low, the module's PMU (Power Management Unit) will be reset. Then, the module will turn to shutdown state from operation state. The timing sequence requirements of the pulse are as follows:

| Parameter | Condition | Minimum Value | Typical Value | Maximum Value | Unit |
|---|---|---|---|---|---|
| Pulse Width | | 100 | 300 | 3000 | ms |

The timing sequence control is shown in the diagram below:

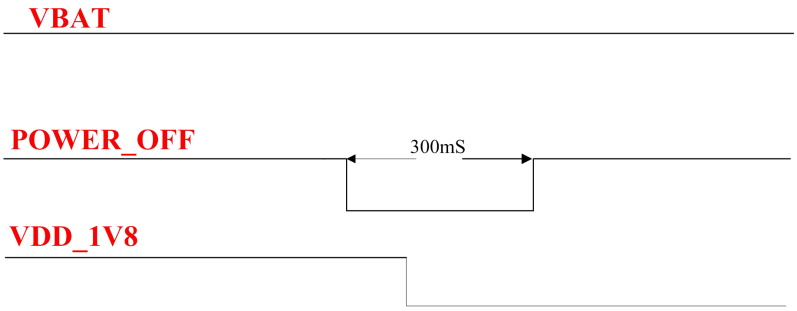



Figure 5- 4 Timing Control

The recommended design of POWER_OFF signal is as follows:

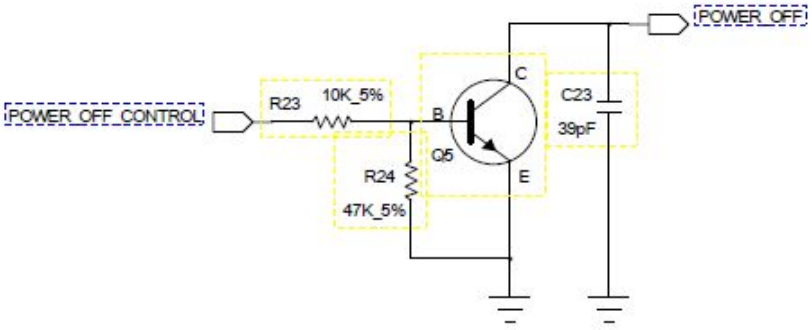



Figure 5- 5 POWER_OFF Reference Design

## 5.2.4 Reset Signal

H330S wireless modules support external reset function. It is feasible to reset the module back to the original state by the Reset Signal.

When setting the Reset Signal low for 100ms, the module will be reset and restarted. When the user uses the Reset function, the PMU inside the module will not lose power.

**Note:**

Reset signal is a sensitive signal line. In designing PCB layout, please keep the line away from RF interference, and make it well wrapped with ground wire. And it is advised to add an anti-shaking capacitor at the place close to the module end.

The timing sequence requirements of its pulse are as follows:

| Parameters | Condition | Minimum Value | Typical Value | Maximum Value | Unit |
|---|---|---|---|---|---|
| Pulse Width | | 100 | 300 | 3000 | ms |

Recommended design:

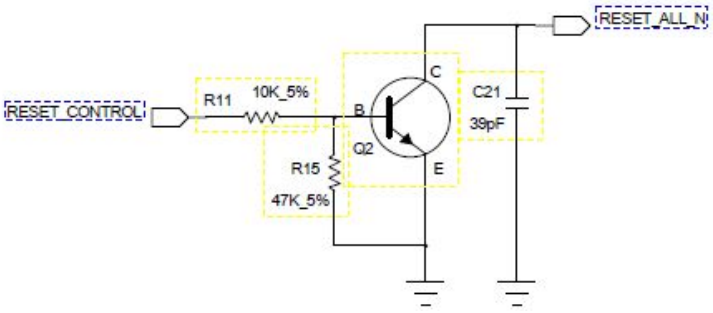



Figure 5- 6 Reset Recommended Design

# 5.3 Status Indicating Signal

The pins of status indicating signal as listed below:

| Pin# | Pin Name | Description |
|---|---|---|
| 86 | LPG | Status indicating |
| 89 | SMI | Sleep Status indicating |
| 56 | WAKE_UP | Sleep wake-up pin |
| 1 | VTRX | Transceiver power supply signal, indicating the power status of the transceiver |
| 64 | VPA | Power supply signal of RF power amplifier |

## 5.3.1 LPG Signal

LPG signal description as listed below:

| Status | Mode |
|---|---|
| idle(unregistered) | 600ms high level, 600ms low level |
| idle(registered) | 75ms high level, 3S low level |

| | |
|---|---|
| Voice communication (Call) | low level |
| Data communicating | 75ms high level, 75ms low level |
| Sleep (sleep mode) | high level |

**Note:**

High level voltage is 1.8V.

## 5.3.2 SMI Signal

SMI signal description as listed below :

| Modes | Description |
|---|---|
| Sleep Mode | 2.5S High; 100ms Low,repeat this |
| Other Mode | low level |

## 5.3.3 WAKE_UP Signal

WAKE_UP is for waking up the module from Sleep mode, it is high level by default, but low level is activated.

| Module Mode | WAKE_UP Signal | Description |
|---|---|---|
| Sleep | Low level | Wake up the module from Sleep mode to Idle mode |
| | High level | Keep the module in Sleep mode |
| Idle/Call | Low/High level | Keep the module in Idle/Call mode |

When the module is in Sleep mode, the function of EINT1/WAKE_UP signal is as follows:

When EINT1/WAKE_UP is at low level under the control of MCU GPIO, it will wake up the module to idle mode.

When EINT1/WAKE_UP is at high level under the control of MCU GPIO, it will keep the module in sleep mode.

## 5.3.4 Other Work Indications

| Pin Name | Electrical Level | Description |
|---|---|---|

| | | |
|---|---|---|
| VTRX | 1.8V | Work indication of RF Transceiver PMU |
| VPA | 0-5V | In transmission, output VCC; 0.65V at the lowest power; 5V at the largest power; 0V in the case of no transmission |

**Note:**

It is only used for indicating work conditions. Keep it in the idle state in actual use. It cannot be used for other purposes.

# 5.4 USB Interface

## 5.4.1 USB Interface Definition

| Pin# | Pin Name | I/O | Description |
|---|---|---|---|
| 31 | USB_DP | I/O | USB signal+ |
| 32 | USB_DM | I/O | USB signal- |
| 33 | USB_ID | — | USB ID signal (NC is recommended) |
| 34 | VUSB | I | USB power input |
| 92 | USB_TEST | — | USB TEST signal(NC is recommended) |

H330S wireless modules support USB 2.0. Before connecting it to PC, it is necessary to install the related USB driver.

After inserting the H330S wireless modules to PC, the USB interface will work with the driver and map seven ports on PC, as follows:

- One 3G Modem/AT port for initiating data traffic

- Three ports for dispatching AT Command
- Two ports for capturing LOG information of the software
- One port reserved for future use

### 5.4.2USB Interface Application

Reference Circuit Design:

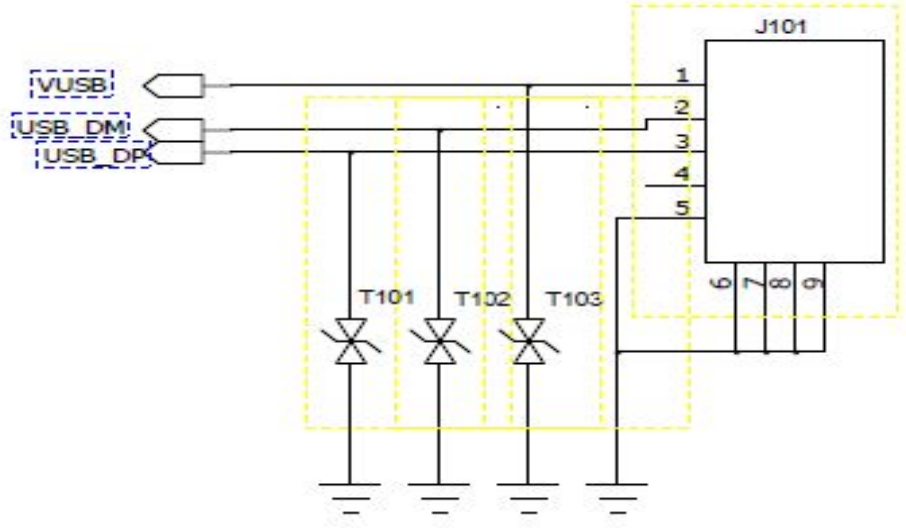



Figure 5- 7 USB Interface Reference Circuit Design

T101 and T102 shall be TVS with capacitance lower than 1pF; there is no specific limitation for the capacitance of T103.

VUSB pin supplies power for USB. The recommended power supply range is 2.5V ~ 5.25V. In designing VUSB, there must be input, or it cannot recognize USB port.

USB_DP and USB_DM are the high-speed differential signal line, and their highest transmission rate is 480Mbps. The following requirements should be followed in designing PCB layout.

- USB_DP and USB_DM signal lines should have the same length, and should be parallel; avoid right angle wiring;
- USB_DP and USB_DM signal lines should be wrapped with GND at the ends.
- USB2.0 differential signal line should be laid at the signal layer closest to the ground layer.
- Ensure impedance matching; impedance is required to be 90ohm.

# 5.5 UART Interface

## 5.5.1 UART Interface Description

H330S wireless modules provide two UART for the users; one is standard 8-line serial port, and the other

2-line serial port.

The 8-line serial port UART1 supports full serial port mode with flow control function, and all the AT commands. Users can download software or receive and dispatch AT through UART1. The 2-line serial port UART2 only supports part of the AT commands.

**Note:**

UART2 only supports the ordinary query function.

The definitions of UART1 and UART2 signal interfaces are as follows:

| **UART1** | | | |
|---|---|---|---|
| **Pin#** | **Pin Name** | **I/O** | **Description** |
| 35 | UART1_RI | O | UART1 Ring Indicator |
| 36 | UART1_DSR | I | UART1 DTE Ready |
| 37 | UART1_DTR | O | UART1 DCE Ready |
| 38 | UART1_DCD | O | UART1 Carrier Detect |
| 39 | UART1_CTS | I | UART1 Clear to send |
| 40 | UART1_RTS | O | UART1 Request to send |
| 41 | UART1_TXD | O | UART1 Transmitted Data |
| 42 | UART1_RXD | I | UART1 Received Data |
| **UART2** | | | |
| **Pin#** | **Pin Name** | **I/O** | **Description** |
| 44 | UART2_RXD | I | UART2 Received Data |
| 45 | UART2_TXD | O | UART2 Transmitted Data |

## 5.5.2 UART Interface Application

Connect UART1 of H330S wireless module (DCE) to PC, and the signal direction of (DTE) is as follows:

| **MCU (DTE) application** | **Signal Direction** | **H330S module (DCE)** |
|---|---|---|
| RXD | ← | UART1_TXD |
| TXD | → | UART1_RXD |
| RTS | → | UART1_CTS |
| CTS | ← | UART1_RTS |

| | | |
|---|---|---|
| DSR | ← | UART1_DTR |
| DTR | → | UART1_DSR |
| RI | ← | UART1_RI |
| DCD | ← | UART1_DCD |

Connect UART2 of H330S wireless module (DCE) to PC, and the signal direction of (DTE) is as follows:

| MCU (DTE) application | Signal direction | H330S module (DCE) |
|---|---|---|
| RXD | ← | UART2_TXD |
| TXD | → | UART2_RXD |

**Note**:

the high level of the module's UART interface is 1.8V. If it needs to connect it to 2.8V or 3.3V IO interface, it is necessary to switch the level.

In design: it is recommended to use SN74LVC2G07 to switch the level from 1.8V to 3.3V. During the communication between UART1 and PC, firstly raise the level from 1.8V to 3.3V, and then, employ SP3238 to switch the level. During the communication between UART2 and PC, firstly raise the level from 1.8V to 3.3V, and then, employ SPIEX3232EEA to switch the level. Pay attention to the signal direction when switching the level.

### 5.5.3Ring Indication

UART1_RI signal is used to indicate the incoming calls and SMS, and dispatch pulses to the host application.

| Working modes | Status |
|---|---|
| Default status | Low level |
| Incoming call ring | 1s high level, and 1s low level, repeat this. |
| New SMS | 150ms pulse |

## 5.6 USIM Interface

H330S series wireless modules support USIM and high speed SIM cards. For now, they do not support 8-line intelligent USIM.

## 5.6.1 USIM Pins

| Pin# | Pin Name | I/O | Function Description |
|---|---|---|---|
| 5 | USIM_VCC | O | USIM power supply signal |
| 6 | USIM_RST | O | USIM Reset signal |
| 7 | USIM_CLK | O | USIM clock signal |
| 8 | USIM_IO | I/O | USIM data signal |
| 12 | GND | GND | USIM ground signal |
| 4 | USIM_CD | I | USIM Plug-in detection signal<br>The internal module has been pulled up.<br>High level indicates that SIM card is not inserted.<br>Low level indicates that card is inserted. |

## 5.6.2 USIM Design

Reference Circuit Design:

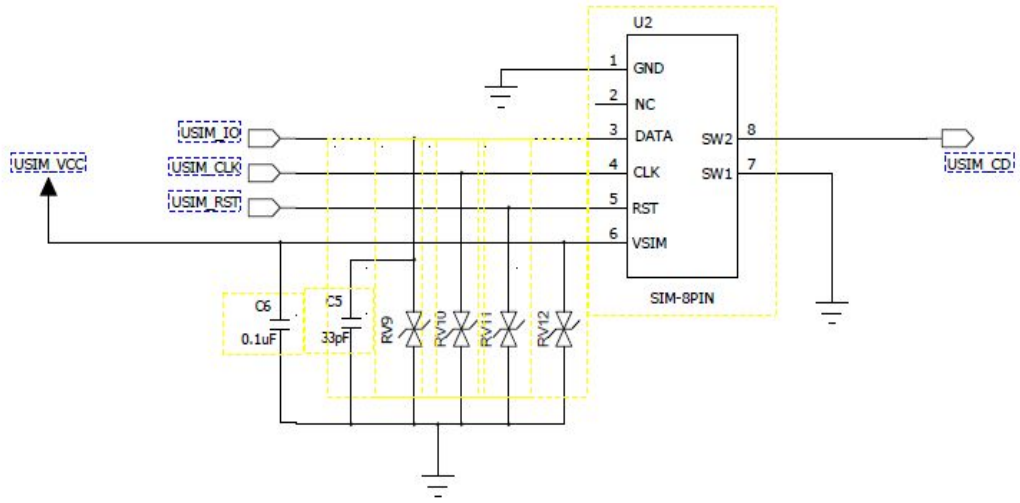



Figure 5- 8 USIM Interface Reference Circuit

**Note:**

- In order to improve EMC performance, the SIM card slot should be close to the module to the largest extent.
- The filter capacitor on the SIM-card signal circuit should be placed close to SIM card pin to the largest extent.
- ESD device (like TVS) shall be added to the SIM-card signal circuit protection. ESD device should be placed close to SIM card pin.
- USIM_IO has been pulled up inside the module. No need to pull it up again from the outside.

- USIM_CD signal connection supports hot-plugging; active low. If the module detects the signal at low level, it means there is a card in the module.

### 5.6.3 Points for Attention in USIM Design

SIM card interface design is very important for the normal operation of the module and SIM card.

The following points need to be complied with during the design:

- SIM card layout and wiring must keep away from EMI interference source, like RF antenna and digital switch signal.
- In order to ensure signal completeness, the wire distance between the module and SIM card should not exceed 100mm.
- In order to avoid mutual interference, USIM_CLK and USIM_IO signals should be separated in wiring. It would be best to wrap them with ground wire respectively.
- SIM card signal line should be protected with ESD. These protective devices should have small capacitance (like Zener diode, etc.). Users are recommended to select ESD devices with equivalent capacitance lower than 33pF. During layout, ESD device should be close to the SIM card interface.

### 5.6.4 USIM Hot-Plugging

H330S supports SIM card status-detection function. This function allows the hot-plugging of SIM card.

#### 5.6.4.1 Hardware Connection

SIM card hot-plugging function needs to work with USIM_CD signal.

USIM_CD will be at high level without SIM card; after inserting SIM card, USIM_CD will be at low level.

In fig. 5-8, USIM_CD signal line is connected to U2's Pin8 (SW2), and Pin7 (SW1) is connected to the ground. When the SIM card is not inserted, SW2 will be at high level. When the SIM card is inserted, SW2 will be connected to SW1 and thus USIM_CD level will be pulled down.

#### 5.6.4.2 Software Settings

"+MSMPD" configures AT command for the SIM card status-detection function.

If set AT+MSMPD=0, SIM card status-detection function will be closed, and the module will not detect USIM_CD signal.

If set AT+MSMPD=1, SIM card status-detection function will be in operation, and the module will detect if the SIM card is inserted by USIM_CD Pin.

If USIM_CD is at low level, which indicates SIM card is inserted, the module will automatically register it to the network.

If USIM_CD is at high level or unconnected, which indicates SIM card is not inserted, the module will not register it to the network.

**Note:**

The default of +MSMPD parameter is "0".

# 5.7 Analog Audio Interface

## 5.7.1 Definition of Audio Interface Signals

H330S wireless modules provide two channels of audio signal input and two channels of audio signal output.

Audio signal definition:

| Pin# | Pin Name | I/O | Description |
|---|---|---|---|
| 13 | AUXO+ | O | Audio channel 2 output signal + |
| 14 | AUXO- | O | Audio channel 2 output signal - |
| 15 | EAR- | O | Audio channel 1 earphone signal output - |
| 16 | EAR+ | O | Audio channel 1 earphone signal output + |
| 17 | MIC+ | I | Audio channel 1 MIC input signal + |
| 18 | MIC- | I | Audio channel 1 MIC input signal - |
| 19 | AUXI- | I | Audio channel 2 auxiliary MIC input signal - |
| 20 | AUXI+ | I | Audio channel 2 auxiliary MIC input signal + |
| 21 | AGND | GND | Audio GND |
| 22 | VSPK | I | Power supply input for audio codec chip's internal power amplifier<br>Recommended to connect to VBAT |

## 5.7.2 Description of Audio Interface Application

Audio input/output signals are differential signals that have good performance in anti-RF-interference. When connecting to the phone handle, it is not necessary to add audio power amplifier.

As to PCB layout, the wires should have the same length, and should be parallel and as short as possible. The wires should be wrapped with ground wire. The input and output signals should be separated by grounding. It would be best to add ESD protection to the audio signal port.

### 5.7.2.1 Audio Channel 1

Audio channel 1 is a differential audio port for calls through phone handle.

Audio channel 1: level features of MIC input interface

| Parameters | Test conditions | Minimum Value | Typical Value | Maximum Value | Unit |
|---|---|---|---|---|---|
| Bias voltage | Without load | | 2.5 | 2.6 | V |

| | | | | | |
|---|---|---|---|---|---|
| Gain | Programmable, stepping gain: 2dB | 0 | | 16 | dB |
| Designed load impedance | | | 2.2 | | Kohm |

Audio channel 1: level features of EAR output interface:

| Parameters | Test conditions | Minimum Value | Typical Value | Maximum Value | Unit |
|---|---|---|---|---|---|
| Output voltage | Without load | | | 1.4 | Vpp |
| Designed load impedance | | | 32 | | ohm |
| DC Bias voltage | | | 1 | | V |

### 5.7.2.2 Audio Channel 2

Audio channel 2 is a differential audio port for applicable to hands-free calls. .

**Note:**

Audio channel 2's downlink can only be used when VSPK power supply is normal. Generally, VSPK is connected directly to VBAT.

Audio channel 2: level features of AUXI input interface

| Parameter | Test conditions | Minimum Value | Typical Value | Maximum Value | Unit |
|---|---|---|---|---|---|
| Bias voltage | No load | | 2.5 | 2.6 | V |
| Gain | Programmable, steps gain:2dB | 0 | | 32 | dB |
| Load resistance | | | 2.2 | | Kohm |

Audio channel 2: level features of AUXO output interface:

| Parameter | Test conditions | Minimum Value | Typical Value | Maximum Value | Unit |
|---|---|---|---|---|---|
| Out voltage | No load | | | 3.8 | Vpp |
| Load resistance | | | 8 | | ohm |

## 5.8 Digital Audio

H330S supports digital audio I2S interface that supports normal I2S mode and PCM mode. I2S interface level is 1.8V on average.

I2S signal description:

| Pin# | Pin Name | I/O | Description |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 24 | I2S2_CLK0 | O | Bit Clock |
| 25 | I2S2_WA0 | O | Left and right channel clock (LRCK) |
| 26 | I2S2_TX | O | Serial data output |
| 27 | I2S2_RX | I | Serial data input |
| 28 | I2C_DATA | I/O | I2C control signal input/output |
| 29 | I2C_SCL | O | I2C control clock signal |
| 54 | CLKOUT0 | O | 26MHz main clock output |

### 5.8.1 I2S

| H330S | Signal Direction | Audio CODEC I2S Port |
|---|---|---|
| I2S2_CLK0 | → | I2S_CLK |
| I2S2_WA0 | → | I2S_LRCK |
| I2S2_RX | ← | I2S_SDIN |
| I2S2_TX | → | I2S_SDOUT |
| CLKOUT0 | → | I2S_MCLK |

### 5.8.2I2C

| H330S | Signal Direction | Audio CODEC I2C Port |
|---|---|---|
| I2C_SDA | ↔ | I2C_SDA |
| I2C_SCL | → | I2C_SCL |

Description:

- I2S interface can be configured as client-server work mode.
- Suitable for various audio sampling frequencies(48KHz, 44.1KHz, 32KHz, 24KHz, 22.5KHz, 16KHz, 12KHz, 11.025KHz and 8KHz).

### 5.8.3PCM Port Description

| H330S | Signal Direction | Audio CODEC PCM Port |
|---|---|---|
| I2S2_CLK0 (PCM_CLK, PCM clock signal ) | → | PCM_CLK (PCM clock signal) |
| I2S2_WA0 (PCM_SYNC, PCM frame synchronization signal ) | → | PCM_SYNC (PCM frame synchronization signal ) |
| I2S2_RX (PCM_DIN, PCM data input) | ← | PCM_DOUT (PCM data output) |

| | | |
|---|---|---|
| I2S2_TX (PCM_DOUT, PCM data output) | ⟶ | PCM_DIN (PCM data input) |

**Note:**

- PCM interface can be configured as client-server work mode.
- Support short frame synchronization at 16, 32, 48, and 64 bit mode
- Support burst and continuous mode transmission
- Suitable for various audio sampling frequencies(48KHz, 44.1KHz, 32KHz, 24KHz, 22.5KHz, 16KHz, 12KHz, 11.025KHz and 8KHz).

## 5.9 ADC Interface

H330S supports ADC detection, including two channels (ADC1 and ADC2), with precision of 10bit. ADC input voltage is required to be 0~1.2V.

ADC signal description:

| Pin# | Pin Name | I/O | Description |
|---|---|---|---|
| 50 | ADC2 | I | ADC detection channel 2 |
| 51 | ADC1 | I | ADC detection channel 1 |

## 5.10 Other Interfaces

The module support GPIO port when reusing with other function ports, but does not support MIPI、MMC、DAC ports yet.

# 6 Electrical and Environmental Features

## 6.1 Electrical Features

The table below lists the range of H330S's electrical characteristics:

| Parameters | Minimum Value | Maximum Value | Unit |
|---|---|---|---|
| Power supply signal | 0 | 4.2 | V |
| Digital signal | 0 | 1.9 | V |

## 6.2 Environmental Features

This table below shows the environmental features of H330S.

| Parameters | Minimum Value | Maximum Value | Unit |
|---|---|---|---|
| Operational Temperature | -30 | +75 | °C |
| Restricted operating temperature[1] | -40 | +85 | °C |
| Storage Temperature | -40 | +85 | °C |

**Note[1]:**

for the temperature is out of the normal temperature range: -30℃ ~ +75, some indexes may slightly deviate from the related 3GPP codes.

# 7 RF Interface

There are small differences between different models. Please refer to the first table in chapter two.

## 7.1 Operating Frequency Band

### 7.1.1 Frequency Range of Main Antenna

| Operating Band | Tx | Rx |
|---|---|---|
| UMTS 2100 (Band I IMT) | 1920–1980 MHz | 2110–2170 MHz |
| UMTS 1900 (Band II PCS) | 1850–1910 MHz | 1930–1990 MHz |
| UMTS 850 (Band V CLR) | 824–849 MHz | 869–894 MHz |
| UMTS 900 (Band VIII GSM) | 880–915 MHz | 925–960 MHz |
| GSM 850 | 824–849 MHz | 869–894 MHz |
| GSM 900 | 880–915 MHz | 925–960 MHz |

| | | |
|---|---|---|
| DCS 1800 | 1710–1785 MHz | 1805–1880 MHz |
| PCS 1900 | 1850–1910 MHz | 1930–1990 MHz |

# 7.2 RF PCB Design

## 7.2.1Wiring Principle

Because H330S has no RF connector, the user needs to connect a length of RF line to the antenna, or design a connector on the board. So, it is recommended to use microstrip line for RF line. It should be as short as possible with loss controlled below 0.2dB, and impedance of 50 ohm.

Reserve a π circuit (the earth terminals of the two parallel devices should be directly connected to the main ground) between H330S module and the antenna connector (or feed point) for antenna tuning.

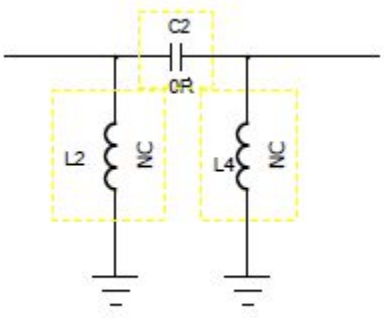



Figure 7- 1π-type Circuit

## 7.2.2Impedance Design

The impedance of RF signal line of antenna interface needs to be controlled at 50 ohm.

# 7.3 Antenna Design

## 7.3.1 Main Antenna Design Requirements

### 7.3.1.1 Antenna efficiency

Antenna efficiency is the ratio of the input power and radiant power. Because of the antenna's return loss, material loss and coupling loss, the radiant power is always lower than the input power. The ratio is recommended to be > 40% (–4dB).

### 7.3.1.2 S11 or VSWR

S11 shows the matching degree of the antenna's 50 ohm impedance, which affects antenna efficiency to a certain extent. It is feasible to use VSWR testing method to measure the index. It is recommended that S11 < –10dB.

### 7.3.1.3 Polarization

Polarization is the rotation direction of the electric field of the antenna at the direction of the largest radiation.

It is recommended to use linear polarization; for diversity antenna, it is recommended to use different polarization directions from that of the main antenna.

#### 7.3.1.4 Radiation pattern

Radiation pattern refers to the electromagnetic field intensity at various directions in the far field of the antenna. Half-wave doublet antenna is the perfect terminal antenna. In the case of built-in antenna, it is recommended to use PIFA.

- Antenna area: H 6mm * W 10mm * L 100mm. It is recommended to use PIFA or IFA.
- Antenna radiation direction: Omni-directional.

#### 7.3.1.5 Gain and directivity

Antenna directivity refers to the electromagnetic field intensity at various directions of the electromagnetic wave. Gain is the combination of the antenna efficiency and antenna directivity. It is recommended that antenna gain ≤ 2.5dBi.

#### 7.3.1.6 Interference

In addition to antenna performance, other interference from the PCB will also affect the module performance. In order to ensure the high performance of the module, the interference must be under control. Suggestions: keep speaker, LCD, CPU, FPC wiring, audio circuit, and power supply away from the antenna; add appropriate separation and shielding devices, or conduct filtering on the path.

#### 7.3.1.7 TRP/TIS

TRP (Total Radiated Power):

- W850/W900/W1900/W2100>19dBm
- GSM850>28dBm
- GSM900>28dBm
- DCS1800>25dBm
- PCS1900>25dBm

TIS (Total Isotropic Sensitivity) :

- W850/W900<-102dBm
- W1700/W1900/W2100<-103dBm
- GSM850<-102dBm
- GSM900<-102dBm
- DCS1800/PCS1900<-102dBm