FIBOCOM
Perfect Wireless Connection

H330 HSPA+ Module Hardware User Manual

Version: V1.0.0
Date: 2012-05-29

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Revision History

Version	Date	Remarks
V1.0.0	2012-05-29	Initial

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Contents

1 Preface

1.1 Scope

This manual provides the electrical, mechanical and environmental requirements for properly integrating the H330 HSPA+ module in a host application.

This manual gives a complete set of hardware features and functions that may be provided by H330. The availability of any feature or function, which is described in this manual, depends on the hardware revision and software version of a specific H330 HAPA+ module.

1.2 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 Introduction

2.1 Product Description

H330 is a high integrity 3G WCDMA wireless module, LGA package, 120 pin. It can support GSM/GPRS/EDGE GSM850/900/DCS1800/PCS1900MHz and UMTS/HSDPA/HSUPA/HSPA+ 850/900/1900/2100MHz.

2.2 Product Specification

Product Features
Supported Bands：
• 4 Band UMTS/HSPA (WCDMA/FDD)
850/900/1900/2100 MHz
• 4 Band GSM
850/900/1800/1900 MHz
Data：
• UMTS/HSDPA/HSUPA 3GPP release 7
• HSUPA 5.76Mbps (Cat 6)
• HSDPA 21Mbps (Cat 14)
• GSM 3GPP release 7
• EDGE (E-GPRS) multi-slot class 12
• GPRS multi-slot class 12
Physical：
• Size：33.8mm x 27.8mm
• Height：2.45 mm
• Mounting：LGA
• Weight：< 6 grams
Environmental
• Operating Temperature：-30℃ ~ +65℃

• Storage Temperature：-40℃ ~ +85℃
Performance
Operating Voltage
• Voltage: 3.6 ~ 4.2V
Current Consumption(Typical)
• 2mA (Sleep Mode)
• 3G Idle: 35mA
• 3G Talk: 500mA
• 2G Talk: 260mA (GSM PCL5)
Tx Power(Typical)
• UMTS/HSPA Class3 (24dBm)
• GSM 850/900 MHz Class4 (33dBm)
• GSM 1800/1900 MHz Class1 (30dBm)
• EDGE 850/900 MHz Class E2 (27dBm)
• EDGE 1800/1900 MHz Class E2 (26dBm)
Rx Sensitivity(Typical)
• UMTS/HSPA：-109dBm
• GSM：-107dBm
Interface
Connectors
• RF Through Pads in LGA, 2 x mini-UFL in PCIe model
• Main Antenna
• Diversity Antenna
Connectivity
• 1*USB 2.0
• 2*UART

• MUX Over UART1
• Multiple Profiles over USB
• SPI Support
• I2C Support
• I2S Support
Data Features
• Embedded TCP/IP and UDP/IP protocol stack
HSPA+
• Max uplink 5.76Mbps
• Max downlink 21Mbps
EDGE
• Multi-slot class 12
(4 Down; 4 Up; 5 Total)
• Coding Scheme MCS1-MCS9
GPRS
• Multi-slot class 12
(4 Down; 4 Up; 5 Total)
• Coding Scheme CS1-CS4
CSD
• UMTS
• GSM
SMS
• MO / MT Text and PDU modes
• Cell broadcast
Voice Features
• Telephony

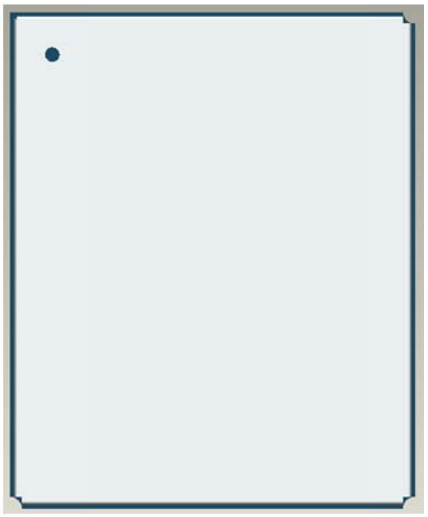
• Analog and Digital Audio
• Voice coders EFR/HR/FR/AMR
Audio Control
• Broad gain control
• Echo suppression
• Noise suppression
• Side tone
Character Set
• IRA
• GSM
• UCS2
• HEX
Control/Status Indications
• GPIO’s
• A/D
• RTC
AT Command Set
• G&T proprietary AT commands
• GSM 07.05
• GSM 07.07
Accessories
• Firmware Loader Tool over USB/UART
• User Manual
• Developer Kit
Regulatory and Approvals
• FCC

• RoHS
• CE
• RRB

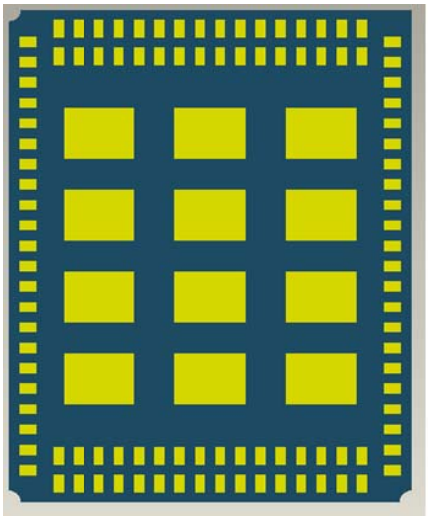
2.3 Product Appearance

H330 HSPA+ Module Appearance is below。

Top View：

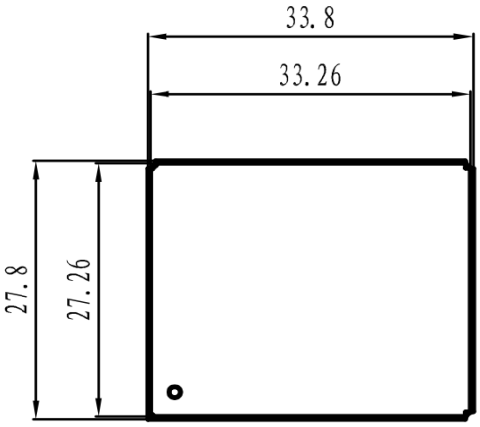


Bottom View：

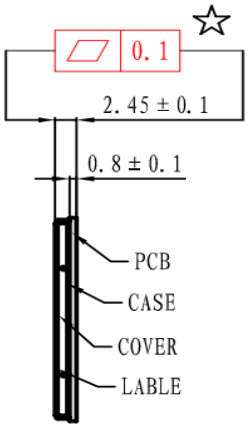


3 Mechanical

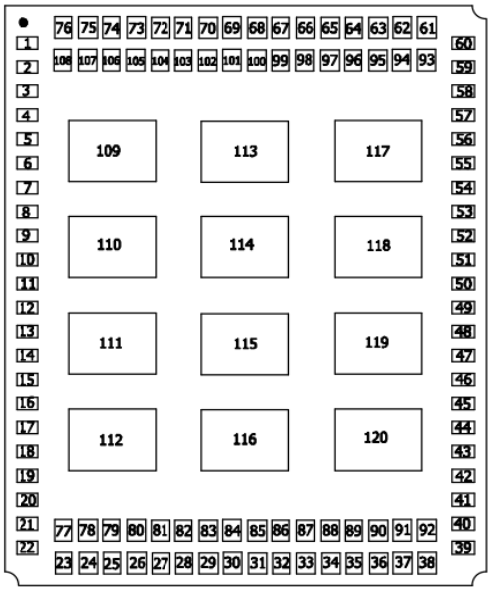
3.1 Dimension



Top View

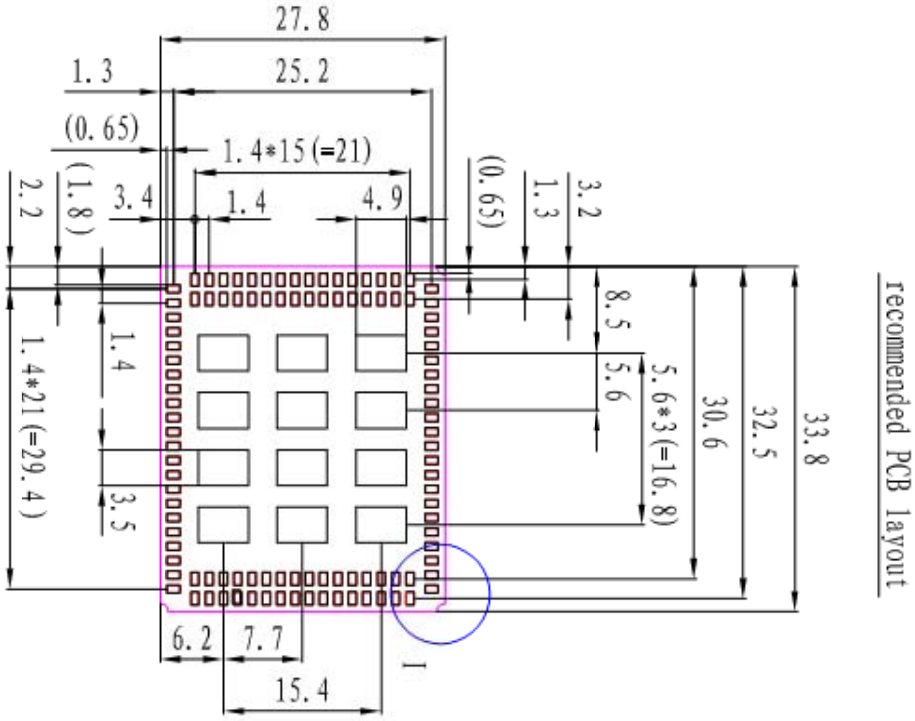


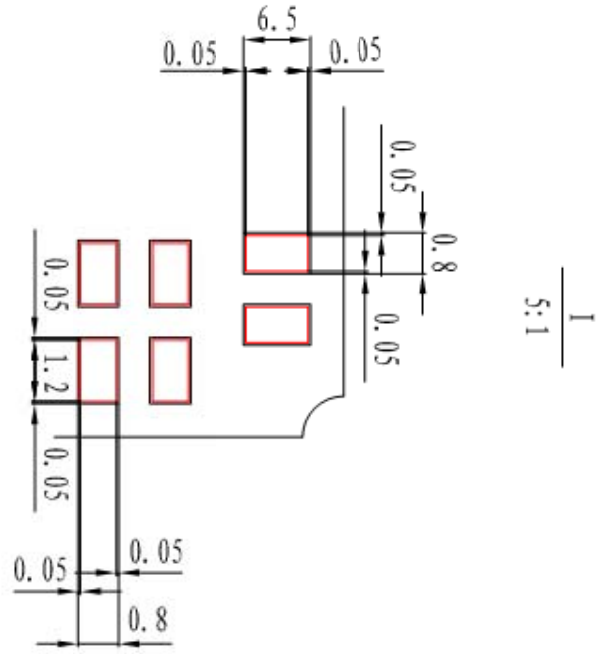
Side View



Bottom View

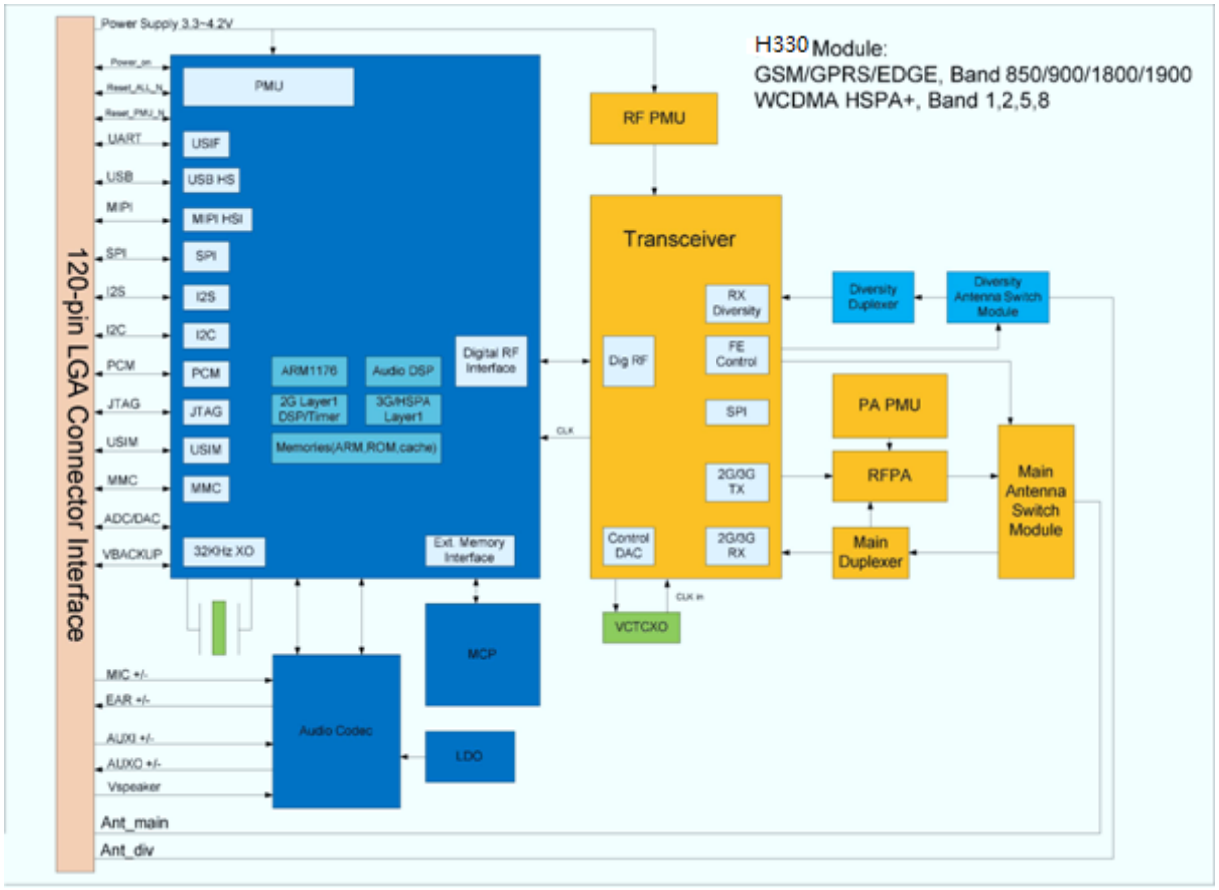
3.2 Recommend PCB Design





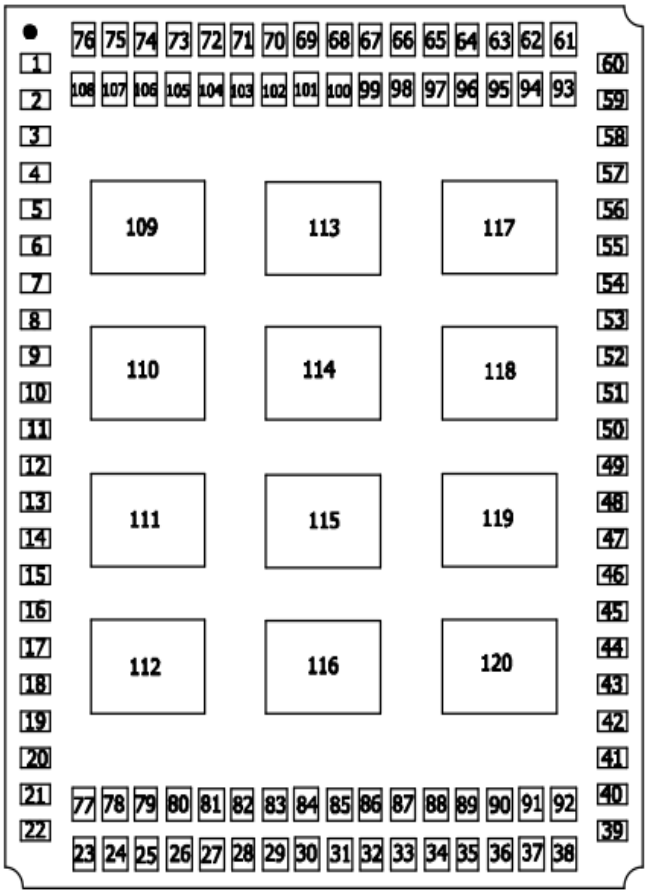
4 Hardware Scope

4.1 Block Diagram



4.2 Pin Definition

4.2.1 Pin Map



4.2.2 Pin Description

Notice: H330 logic electrical level is1.8V.

H330 Pin description：

Pin#	Pin Name	I/O	Description
Power			
59	VBAT	I	Power supply
60	VBAT	I	
61	VBAT	I	
62	VBAT	I	
64	VPA	O	Power supply indicator for RF PA
1	VTRX	O	Power supply indicator for RF transceiver

46	VIO	O	Digital power supply 1.8V.
47	VRTC	I/O	Real time clock power ,1.71V ~ 1.89V
On/off			
48	POWER_OFF	I	Off control signal
49	POWER_ON	I	On control signal
Reset			
77	RESET_ALL_N	I	External reset signal
USIM			
4	USIM_CD	I	USIM insert detect, low activity
5	USIM_VCC	O	USIM power supply
6	USIM_RST	O	USIM reset
7	USIM_CLK	O	USIM clock
8	USIM_DATA	I/O	USIM data
High Speed SIM			
9	USIM_D+		High speed SIM USB data line+（No support）
10	USIM_D-		High speed SIM USB data line-（No support）
Audio			
13	AUXO+	O	Audio channel2 output+
14	AUXO-	O	Audio channel2 output -
15	EAR-	O	Audio channel1 output -
16	EAR+	O	Audio channel1 output +
17	MIC+	I	Audio channel1 input +
18	MIC-	I	Audio channel1 input -
19	AUXI-	I	Audio channel2 input -
20	AUXI+	I	Audio channel2 input +。
21	AGND	GND	Audio GND

22	VSPK	I	Audio codec speaker part power supply, connect to VBAT
I²S			
11	I2S2_CLK1	O	I2S2 clock
24	I2S2_CLK0	O	I2S2 clock
25	I2S2_WA0	O	I2S2 word alignment select
26	I2S2_TX	O	I2S2 transmit line
27	I2S2_RX	I	I2S2 receive line
USB			
31	USB_DP	I/O	USB data line +
32	USB_DM	I/O	USB data line -
33	USB_ID	—	USB ID line
34	VUSB	I	USB power supply
92	USB_TEST	—	USB TEST line
I²C			
28	I2C_SDA	I/O	I2C data line
29	I2C_SCL	O	I2C clock line
UART1			
35	UART1_RI	O	UART1 Ring indicator
36	UART1_DSR	I	UART1 DTE Data Set ready
37	UART1_DTR	O	UART1 DCE Data Terminal 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			

45	UART2_TXD	O	UART2 Transmitted Data
44	UART2_RXD	I	UART2 Received Data
ADC			
50	ADC2		Analog digital converter 2（No support）
51	ADC1		Analog digital converter 1（No support）
EINT			
56	WAKE_UP	I	Wake up signal, low activity.
57	EINT2	I	External interrupt, low activity.
USB HSIC			
90	HSIC_USB_DATA		HSIC USB data signal（No support）
91	HSIC_USB_STRB		HSIC USB pulse signal（No support）
Antenna			
67	ANT_MAIN	I	Main antenna port, 50ohm impedance
71	ANT_DIV	I	Diversity antenna port, 50ohm impedance
Other			
23	DACOUT		No Support
53	T_OUT0		No support
54	CLKOUT0		No support
55	CLK32K		No support
89	SMI	I	Sleep Mode Indicator
86	LPG	O	Module word mode indicator
Not Connect			
73	NC		
74	NC		
75	NC		
76	NC		

105	NC		
106	NC		
107	NC		
108	NC		
78	NC		
79	NC		
80	NC		
81	NC		
82	NC		
83	NC		
84	NC		
85	NC		
87	NC		
88	NC		
94	NC		
95	NC		
96	NC		
101	NC		
GND			
2	GND		
12	GND		
21	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		
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		

5 Hardware Interface

5.1 Power Interface

5.1.1 VBAT

The H330 power supply must be a single external DC voltage source of 3.6V to 4.2V. The power supply must be able to sustain the voltage level during a GSM transmit burst current serge, which may reach **2.0A**.

It is requirement below:

Parameter	Min.	Recommend	Max.	Unit
VBAT	3.6	3.8	4.2	V

Special care must be taken when designing the power supply of the H330. The single external DC power source indirectly supplies all the digital and analog interfaces, but also directly supplies the RF power amplifier (PA). Therefore, any degradation in the power supply performance, due to losses, noises or transients, will directly affect the H330 performance.

The burst-mode operation of the GSM transmission and reception draws instantaneous current surges from the power supply, which causes temporary voltage drops of the power supply level. The transmission bursts consume the most instantaneous current, and therefore cause the largest voltage drop. If the voltage drops are not minimized, the frequent voltage fluctuations may degrade the H330 performance.

It is recommended that the voltage drops during a transmit burst will not exceed 300mV, measured on the H330 interface connector.

In any case, the H330 supply input must not drop below the minimum operating level during a transmit burst. Dropping below the minimum operating level may result in a low voltage detection, which will initiate an automatic power-off.

To minimize the losses and transients on the power supply lines, it is recommended to follow these guidelines:

- Use a 1000 uF, or greater, low ESR capacitor on the H330 supply inputs. The capacitor should be located as near to the H330 interface connector as possible.
- Use low impedance power source, cabling and board routing.
- Use cabling and routing as short as possible.
- Filter the H330 supply lines using filtering capacitors, as described in the table.

Recommended Capacitor	Usage	Description
1000uF	GSM Transmit current serge	Minimizes power supply losses during transmit bursts. Use maximum possible value.
10nF, 100nF	Digital switching noise	Filters digital logic noises from clocks and data sources.
8.2pF, 10pF	1800/1900 MHz GSM bands	Filters transmission EMI.
33pF, 39pF	850/900 MHz GSM bands	Filters transmission EMI.

5.1.2 Power Consumption

Parameter	Description	Condition		Typical	Unit
I off	RTC mode			53uA	uA
I idle	Idle mode			20.4	mA
I sleep	Low power mode	DRX	2	2.0	mA
		DRX	5	2.0	
		DRX	9	2.0	
$I_{GSM-RMS}$	GSM voice - 1 TX slot 1 Rx slot	GSM850 PCL	5	222.8	mA
			10	77.8	
			15	48.9	
			19	44.9	
		EGSM900 PCL	5	229.8	
			10	78.3	
			15	45.3	
			19	44.3	
		DCS1800 PCL	0	152.0	
			5	68.0	
			10	47.1	

			15	45.0	
		PCS1900 PCL	0	150.9	
			5	68.6	
			10	47.1	
			15	44.6	
$I_{GPRS-RMS}$	GPRS Class 12 - 4 TX slot 1 Rx slot	GSM850 PCL	5	565.1	mA
			10	213.6	
			15	105.4	
			19	91.3	
		EGSM900 PCL	5	583.4	
			10	217.7	
			15	105.5	
			19	911.0	
		DCS1800 PCL	0	353.5	
			5	167.6	
			10	95.3	
			15	86.3	
		PCS1900 PCL	0	373.7	
			5	174.4	
			10	100.4	
			15	91.6	
$I_{EGPRS-RMS}$	EGPRS Class 12 - 4 TX slot 1 Rx slot	GSM850 PCL	8	488.7	mA
			14	142.4	
			19	90.9	
		EGSM900 PCL	8	504.7	
			14	146.9	

			19	91.2	
		DCS1800 PCL	2	498.4	
			9	104.6	
			15	91.0	
		PCS1900 PCL	2	496.9	
			9	113.1	
			15	98.4	
$I_{GSM-MAX}$	Peak current During TX slot	GSM850 PCL	5	1556.4	mA
			10	350.2	
			15	120.5	
			19	91.3	
		EGSM900 PCL	5	1595.4	
			10	358.8	
			15	90.9	
			19	97.9	
		DCS1800 PCL	0	952.9	
			5	270.6	
			10	115.1	
			15	92.4	
		PCS1900 PCL	0	957.2	
			5	278.1	
			10	110.6	
			15	92.4	
$I_{WCDMA-RMS}$	WCDMA	Band5 (850)	24dBm	455.7	mA
			0dBm	142.0	
			-24dBm	135.4	

			-50dBm	133.7	
		Band2 (1900)	24dBm	512.5	
			0dBm	146.3	
			-24dBm	137.2	
			-50dBm	135.6	
		Band1 (2100)	24dBm	564.2	
			0dBm	117.1	
			-24dBm	105.4	
			-50dBm	103.4	
		Band8 (900)	24dBm	431.9	
			0dBm	142.3	
			-24dBm	135.8	
			-50dBm	134.1	

5.1.3 VIO

The H330 incorporates a regulated voltage output VIO. The regulator provides a 1.8V output for use by the customer application. It can be used as a indicator.

It is for module to power supply digital signal internal H330, so it can be used as a reference level for digital signal.

Parameter	Min.	Typical	Max.	Unit
VIO @ working	1.773	1.8	1.827	V

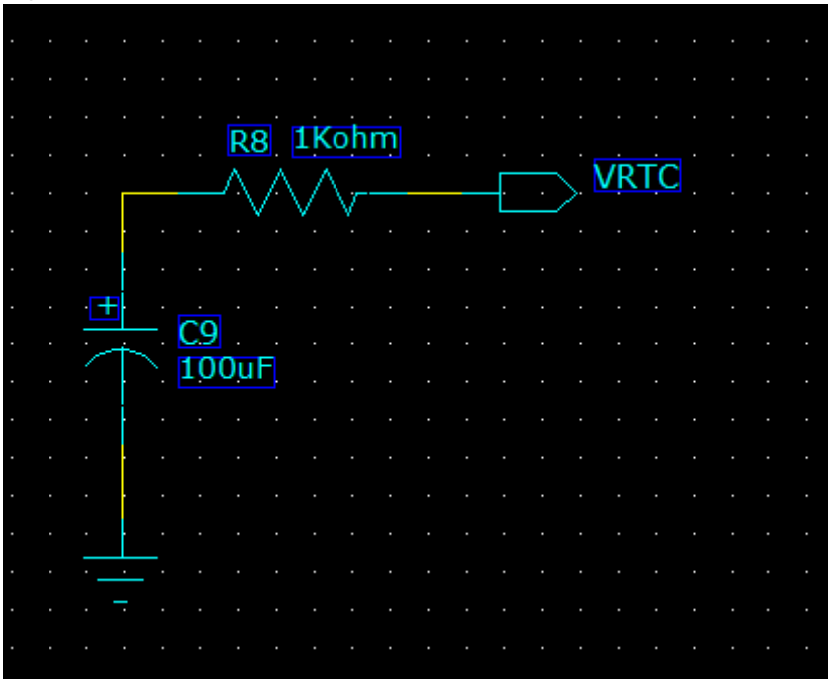
5.1.4 VRTC

VRTC is a power supply for module RTC circuit and can be connect to external RTC battery.

Parameter	Min.	Typical	Max.	Unit
VRTC Output Voltage	1.71	1.8	1.89	V

VRTC Input Voltage (RTC is working)	0.5	1.8	1.89	V
VRTC Input Current (RTC is working)			1.5	uA

VRTC reference design is below:



Notes：

R8 is limited resistor.

VRTC consumption current is less than 2uA.

C9 can determine the reserved time.

5.2 On/Off/Reset

5.2.1 Pin Description

H330 has 3 control signals to on, off ,reset module.

Pin definition is below:

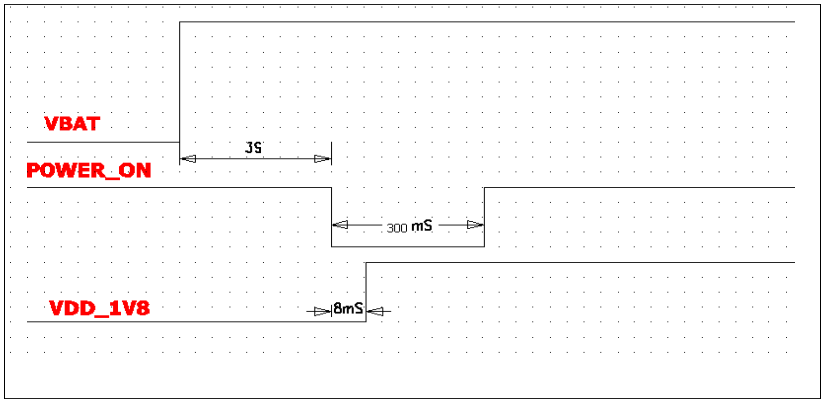
Pin#	Pin Name	Electrical Level	Description
48	POWER_OFF	CMOS 1.8V	Off control signal
49	POWER_ON	CMOS 1.8V	On control signal
77	RESET_ALL_N	CMOS 1.8V	External reset signal

5.2.2 Power on

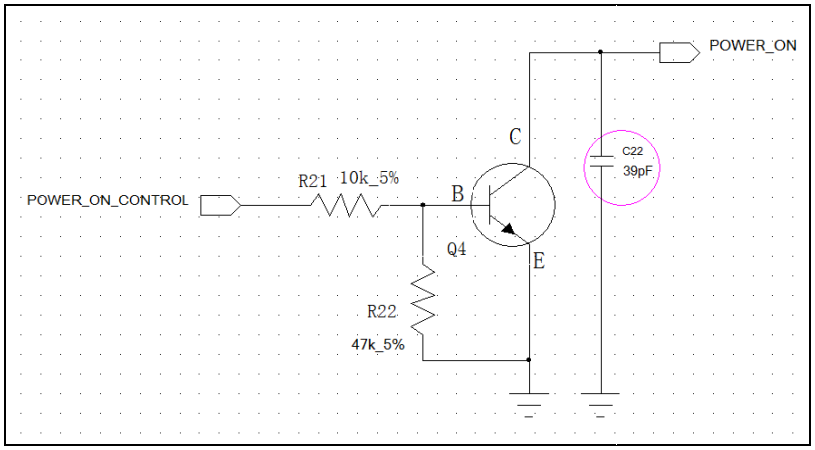
When the H330 is powered off, the PMU operates at low power mode, with only the RTC timer active. H330 will power on again when the POWER_ON signal is falling edge. Asserting the POWER_ON signal low for a minimum of **100 milliseconds** will turn H330 on

Parameter	Condition	Min.	Typical	Max	Unit
Pulse width		100	300		ms

Control timing is below:



Recommand Design:

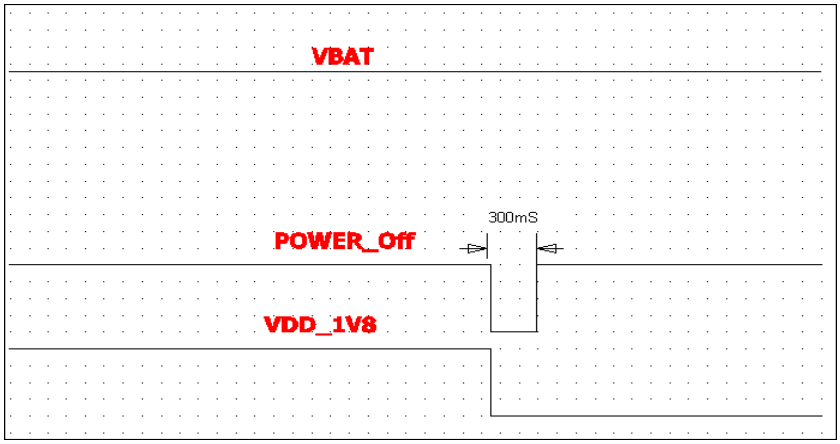


5.2.3 Power off

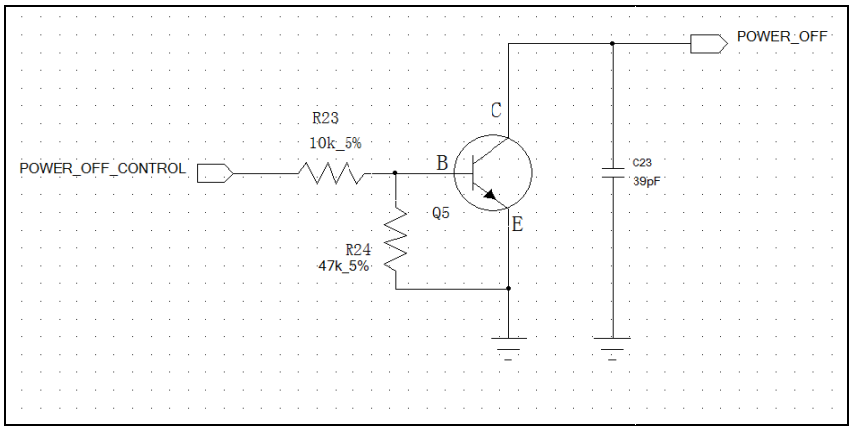
When set POWER_OFF to low level, H330 will be power down.

Parameter	Condition	Min.	Typical	Max	Unit
Pulse width		100	300	3000	ms

Control timing is below:



Recommand Design:



5.2.4 Reset

The RESET_N input signal would be reset the H330 immediately. When the RESET_N signal is low, the H330 is reset without the work net logging out.

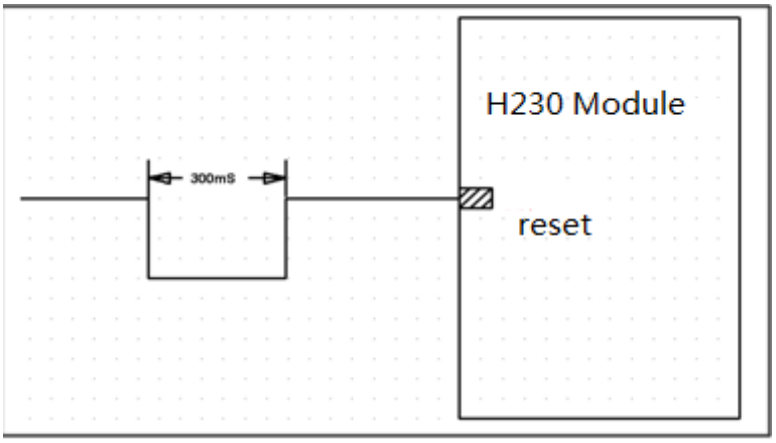
Important:

The reset signal is very important for the system. When design it need be protected totally.

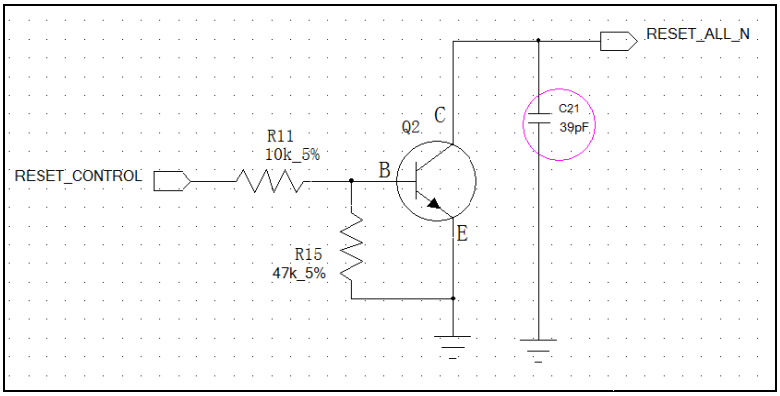
It's recommended that it should connect he 33/39pF capacitor to GND on external circuit.

Parameter	Condition	Min.	Typical	Max	Unit
Pulse width		100	300	3000	ms

Control timing is below：



Recommand Design：



5.3 Indicator Signal

5.3.1 Pin Description

Pin#	Pin Name	Description
86	LPG	Work mode indicator
89	SMI	Sleep Mode Indicator
56	WAKE_UP	Wake up module
1	VTRX	Power supply indicator for transceiver
64	VPA	Power supply indicator for RF PA

5.3.2 Indicator Description

5.3.2.1 LPG

LPG working state description is below:

State	Work mode
• NO SIM card • SIM Error • Registering network • Register network failure (always)	600ms High, 600ms Low
• IDLE mode	75ms High, 3S Low
• Calling	Low
• Data communicating	75ms High, 75ms Low
• Calling Sleep	High

Notice：High level is 1.8V.

5.3.2.2 SMI

Module Mode	SMI Working mode
Sleep Mode	2.5S High; 100ms Low
Other Mode	Low

5.3.2.3 WAKE_UP

Module Mode	WAKE_UP	Working Description
Sleep	Low	Wake up the module, from Sleep to Idle
	High	Keep Sleep mode
Idle/Call	Low	Keep mode, no affect
	High	Module cannot set to Sleep mode

5.3.2.4 Other

Pin Name	Electrical Level	Description
VTRX	1.8V	RF Transceiver PMU work indicator
VPA	0-4.3V	It works in Tx mode, when the low power it is about 0.65V, when the max. power it is about 4.3V, other mode it is 0V

Notice: They are indicator signal, it cannot be used for other, it can be set NC.

5.4 USB Interface

5.4.1 USB Pin Description

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
34	VUSB	I	USB power supply
92	USB_TEST	—	USB TEST signal

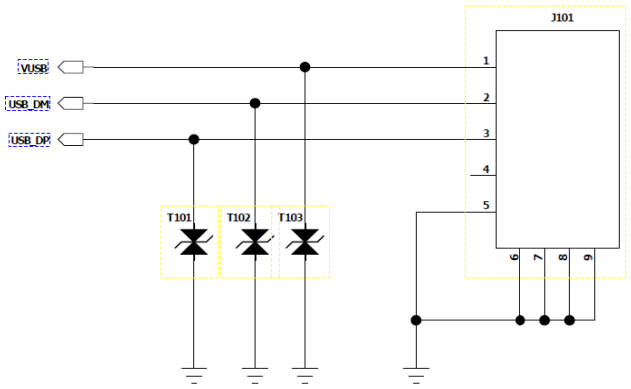
H330 can support USB2.0. It is need to install USB driver.

When H330 connect to PC by USB, PC will get 7 port blow:

- 1 port is for 3G Modem to do data operation
- 2 ports are for AT Command.
- 2 ports are for trace.
- 2 ports are reserved.

5.4.2 USB Design

Reference Design：



T101 and T102 should be low capacitor TVS, it is below 1 pF.

VUSB is USB power supply, it is 2.5V ~ 5.25V.

Notice:

VUSB should be connect to a level (2.5V ~ 5.25V) or USB cannot be recognized.

USB_DP and USB_DM are high speed lines, it is 480 Mbps, It is PCB Layout requirement below:

- The layout design of this circuit on the AP board should comply with the USB 2.0 high speed protocol, with differential lining and impedance control to 90 ohm.
- It is recommended that set USB_DP and USB_DM pins as test points and then place these test points on the AP for debug.
- You don’ t need to connect the USB_VBUS when the function of USB is not used.
- Due to the used enclosure material, the mobile phone shall only be connected to a USB
- Interface of version 2.0 or higher. The connection to so called power USB is prohibited.

5.5 UART

5.5.1 UART Interface

H330 support 2 UART, one is 8 lines ; the other is 2 lines。

- 8 lines UART1 support flow control, can be used to download or AT communication.
- 2 lines UART2 only support AT

UART1 and UART2 defined below：

UART1			
Pin#	**Pin Name**	**I/O**	**Description**
35	UART1_RI	O	UART1 Ring indicator
36	UART1_DSR	I	UART1 DTE Data Set ready
37	UART1_DTR	O	UART1 DCE Data Terminal 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 Transmitted Data
45	UART2_TXD	O	UART2 Received Data

5.5.2 UART Design

H330（DCE）UART1 connect to PC（DTE）, the signal direction is below:

Application MCU(DTE)	Signal direction	H330 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

H330（DCE）UART2 connect to PC（DTE）, the signal direction is below:

Application MCU(DTE)	Signal direction	H330 Module (DCE)
RXD	←	UART2_TXD
TXD	→	UART2_RXD

Notice:

H330 UART high level is 1.8V.

If DTE is not suitable, need add electrical level translation.

When use it, need care about the signal direction.

5.6 USIM

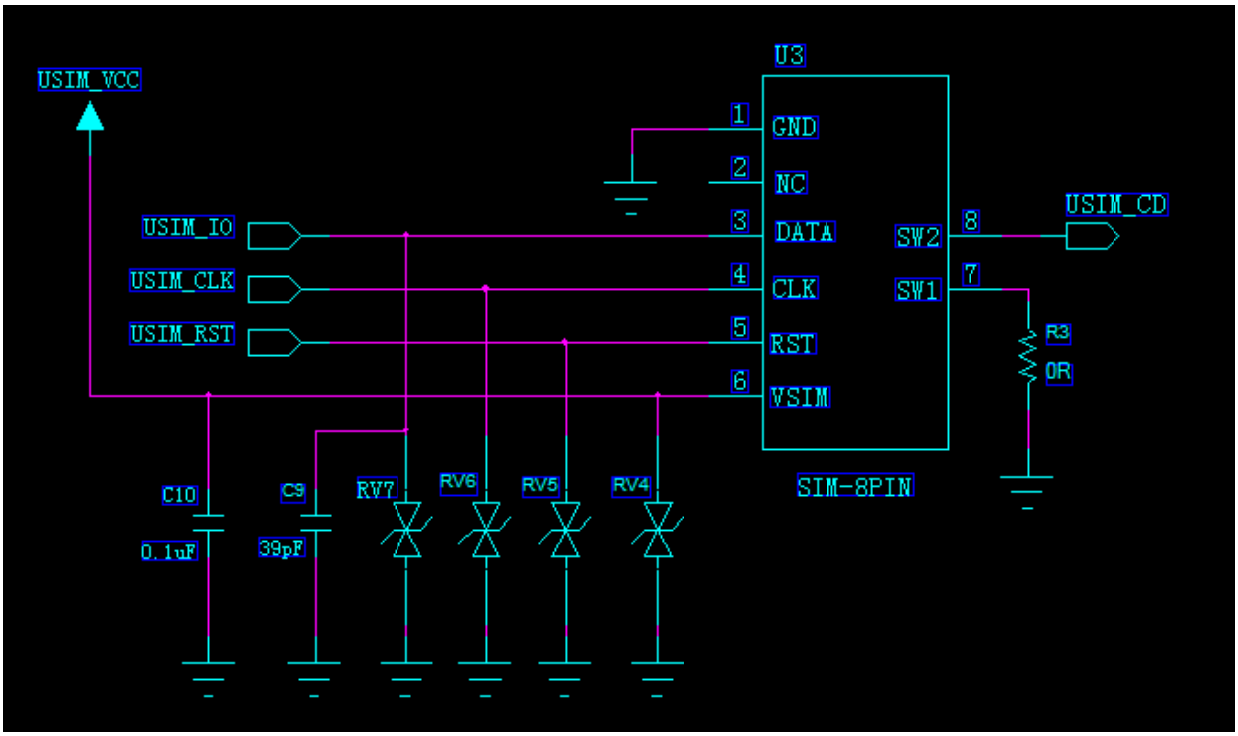
H330 support USIM ,now don't support high speed SIM.

5.6.1 USIM Interface

Pin#	Pin Name	I/O	Description
5	USIM_VCC	O	USIM power supply output
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
4	USIM_CD	I	USIM insert detect signal

5.6.2 USIM Design

Reference design:



Notice:

- USIM_IO is pulled up internal H330.
- USIM_CD can support SIM hot plug, low is active and SIM card is inserted。

5.6.3 USIM Design Notice

The SIM interface and signals design is extremely important for proper operation of H330 and the SIM card. There are several design guidelines that must be followed to achieve a robust and stable design that meets the required standards and regulations.

- The SIM should be located, and its signals should be routed, away from any possible EMI sources, such as the RF antenna and digital switching signals.
- The SIM interface signals length should not exceed 100 mm between the H330 interface connector and the SIM tray. This is to meet with EMC regulations and improve signal integrity.
- To avoid crosstalk between the SIM clock and data signals (SIM_CLK and SIM_DATA), it is recommended to rout them separately on the application board, and preferably isolated by a surrounding ground plane.
- The SIM card signals should be protected from ESD using very low capacitance protective elements (zener diodes, etc.). The recommended part no of ESD is AVR-M1005C080MTAAB (TDK). We also recommended the ESD component should layout with SIM hold closely.

5.6.4 USIM Hot Plug

H330 support SIM hot plug.

5.6.4.1 Hardware Design

When SIM is removed, USIM_CD is high; insert SIM ,USIM_CD is low。

In reference design USIM_CD connect U3 Pin8（SW2）,Pin7（SW1） connect GND.

When no SIM card, SW2 is high; Insert SIM, SW2 connect SW1,USIM_CD is pulled down。

5.6.4.2 Software Design

When set AT+MSMPD=1, the SIM detected feature will be actives. The SIM card is on site or not will be detected with SIM_CD pin.

SIM_CD=Low level, SIM card is onsite and register the network automatically.

SIM_CD=High or NC, SIM card is off site and H330 drop out the network.

Important: The default value of MSMPD parameter is “0”. And also, the SIM detected feature was disabled correspondingly.

5.7 Analog Audio

5.7.1 Pin Description

The H330 audio interface supports two channel audio devices and operating modes. The audio interface's operating modes, active devices, amplification levels and speech processing algorithms are fully controlled by the host application, through advanced programming options and a versatile AT commands set.

Pin#	Pin Name	I/O	Description
13	AUXO+	O	Audio channel2 output+
14	AUXO-	O	Audio channel2 output -
15	EAR-	O	Audio channel1 output -
16	EAR+	O	Audio channel1 output +
17	MIC+	I	Audio channel1 input +
18	MIC-	I	Audio channel1 input -
19	AUXI-	I	Audio channel2 input -
20	AUXI+	I	Audio channel2 input +。

21	AGND	GND	Audio GND
22	VSPK	I	Audio codec speaker part power supply, connect to VBAT

5.7.2 Audio Description

The audio input and output channels are differential interfaces. And have prefect performance at RF Spurious suppression. When connect to the handset, need external audio amplifier.

In PCB Layout, the differential lines need equal length, parallel, as short as possible, for a better performance, the input and output need GND Isolation and the interface need add ESD protection.

5.7.2.1 Audio Channel 1

Audio channel 1 interface are differential lines, Can be use as Hand-phone.

Audio channel 1：MIC input characteristic：

Parameters	Test conditions	Min	Typ	Max	Unit
Bias voltage	No load	1.9	2.0	2.1	V
Gain	Programmable，steps gain:2dB	0		32	dB
Load resistance			2.2		Kohm

Audio channel 1：EAR output characteristic：

Parameters	Test conditions	Min	Typ	Max	Unit
Out voltage	No load			2	Vpp
Load resistance			32		ohm
DC Bias voltage			1		V

5.7.2.2 Audio Channel 2

Audio channel 2 interface are differential lines, Can be use as Hand-free.

Note：The VSPK must be connected to VBAT, Otherwise it will be outwork.

Audio channel 2：AUXI input characteristic：

Parameters	Test conditions	Min	Typ	Max	Unit
Bias voltage	No load	1.9	2.0	2.1	V

Gain	Programmable，steps gain:2dB	0		32	dB
Load resistance			2.2		Kohm

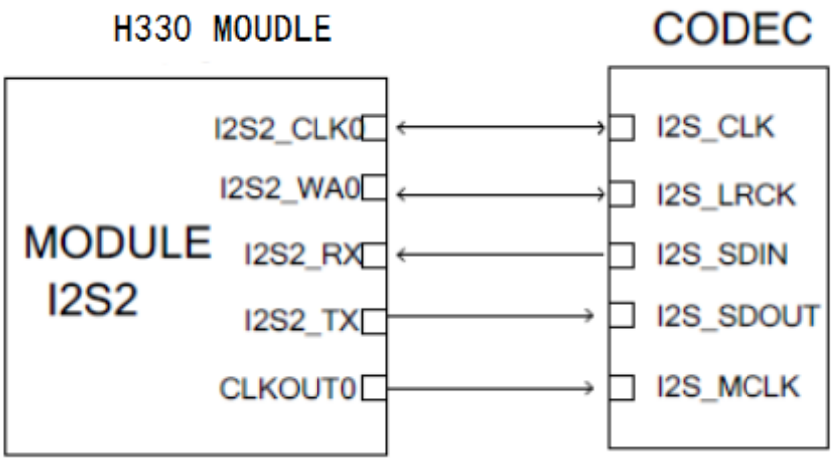
Audio channel 2：AUXO output characteristic：

Parameters	Test conditions	Min	Typ	Max	Unit
Out voltage	No load			4	Vpp
Load resistance			8		ohm
DC Bias voltage			2		V

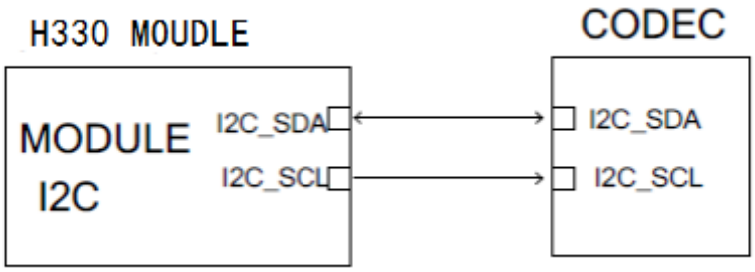
5.8 Digital Audio

Pin#	Pin Name	I/O	Description
24	I2S2_CLK0	O	Bit Clock
25	I2S2_WA0	O	Frame clock(LRCK)
26	I2S2_TX	O	Serial data output
27	I2S2_RX	I	Serial data input
28	I2C_DATA	I/O	I2C data line
29	I2C_SCL	O	I2C clock line
54	CLKOUT0	O	26MHz clock output

5.8.1 I2S



5.8.2 I2C



Notice:

（1） I2S can be set master mode of slaver mode

（2） It support some audio sample rate (48KHz, 44.1KHz, 32KHz, 24 KHz, 22.5 KHz, 16 KHz, 12 KHz, 11.025 KHz, 8 KHz).

5.9 Other

Other are not supported like GPIO、MIPI、MMC、DAC now.

6 Electrical and Environmental

6.1 Electrical Characteristic

The table is H330 electrical characteristic：

	Min.	Max.	Unit
VBAT	-0.2	4.2	V
Digital Signal	-0.2	1.9	V

6.2 Environmental Characteristic

The table is H330 environmental characteristic:

	Condition	Min.	Max.	Unit
Operational Temperature		-30	+85	°C
Storage Temperature		-40	+85	°C

7 RF Interface

H330 module includes main antenna and diversity antenna.

Main antenna：GSM/WCDMA Tx and Rx .

Diversity antenna：WCDMA diversity Rx .

7.1 Operational Band

7.1.1 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)	824–849MHz	869–894 MHz
UMTS 900 (Band VIII GSM)	880–915 MHz	925–960 MHz
GSM 850 MHz	824–849	869–894 MHz
GSM 900	880–915 MHz	925–960 MHz
GSM 1800(DCS)	1710–1785 MHz	1805–1880 MHz
GSM 1900(PCS)	1850–1910 MHz	1930–1990 MHz

7.1.2 Diversity

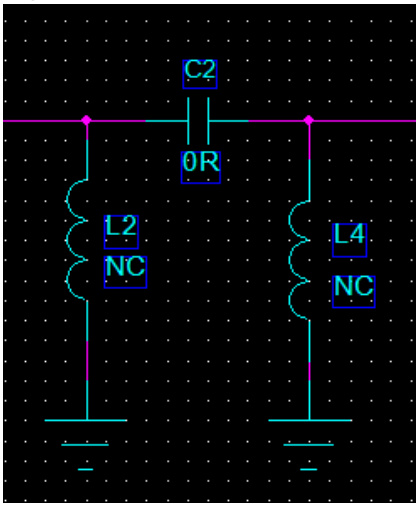
Operating Band	Rx
UMTS 2100 (Band I IMT)	2110–2170 MHz
UMTS 1900 (Band II PCS)	1930–1990 MHz
UMTS 850 (Band V CLR)	869–894 MHz
UMTS 900 (Band VIII GSM)	925–960 MHz

7.1.3 Layout Guideline

When design RF, we need connect H330 module RF pin to antenna, we recommended to use micro-line The shorter the better, insert loss <0.2dB， and impedance is 50ohm.。

It is recommended to mount H330 module and antenna connector to the same side of layout .

Add a π-type circuit (two parallel device ground pin directly to the main land) for antenna matching.



7.1.4 Impedance

All RF lines should be 50ohm impedance。

7.2 Antenna Design

7.2.1 Main Antenna Design Requirement

1. Antenna Efficiency

Antenna efficiency is the ratio of the input power to the radiated or received power of an antenna. The radiated power of an antenna is always lower than the input power due to the following antenna losses: return loss, material loss, and coupling loss. The efficiency of an antenna relates to its electrical dimensions.

Efficiency of the master antenna > 40% (–4dB)

2. S11 or VSWR

S11 (return loss) indicates the degree to which the input impedance of an antenna matches the reference impedance (50 ohm). S11 shows the resonance feature and impedance bandwidth of an antenna. Voltage

standing wave ratio (VSWR) is another expression of S11. S11 relates to the antenna efficiency. S11 can be measured with vector analyzer.

S11 of the master antenna < –10 dB

3. Polarization

The polarization of an antenna is the orientation of the electric field vector that rotates with time in the direction of maximum radiation。

The linear polarization is recommended for the antenna：diversity antenna different to main antenna 。

4. Radiation Pattern

The radiation pattern of an antenna reflects the radiation features of the antenna in the remote field region. The radiation pattern of half wave dipole antennas is the best for wireless terminals. If it is built-in antenna, PIFA antenna is recommended:

- Antenna area ：high 6mm*wide 10mm*long 100mm。
- Radiation Pattern ：omnidirectional

5. Gain and Directivity

The radiation pattern of an antenna represents the field strength of the radiated electromagnetic waves in all directions。

Recommended antenna gain≤ 2.5dBi.

6. Interference

Besides the antenna performance, the interference on the user board also affects the radio performance (especially the TIS) of the module. To guarantee high performance of the module, the interference sources on the user board must be properly controlled. On the user board, there are various interference sources, such as the LCD, CPU, audio circuits, and power supply. All the interference sources emit interference signals that affect the normal operation of the module. For example, the module sensitivity can be decreased due to interference signals. Therefore, during the design, you need to consider how to reduce the effects of interference sources on the module. You can take the following measures: Use an LCD with optimized performance; shield the LCD interference signals; shield the signal cable of the board; or design filter circuits.

7. **TRP/TIS**

TRP (Total Radiated Power):

- W850/W900/W1900/W2100>19dBm
- GSM850>27dBm
- GSM900>28dBm
- DCS1800>25dBm

- PCS1900>25dBm

TIS (Total Isotropic Sensitivity):

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

7.2.2 Diversity antenna design

H330 diversity antenna is optical, If need to support diversity, must to increase the diversity antenna. Diversity antenna design methods and the main antenna, its efficiency indicators to allow the lower 3dB. Main antenna and diversity antenna isolation requirements greater than 12dB.

EU Regulatory Conformance

Hereby, Shenzhen G&T Industrial Development Co., Ltd., declares that this module, model H330 is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

Important compliance information for North American users

The H330 Module has been granted modular approval for mobile applications. Integrators may use the H330 Module in their final products without additional FCC certification if they meet the following conditions. Otherwise, additional FCC approvals must be obtained.

1. At least 20cm separation distance between the antenna and the user's body must be maintained at all times.

2. 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 2.5dBi.

3. The H330 Module and its antenna must not be co-located or operating in conjunction with any other transmitter or antenna within a host device.

4. A label must be affixed to the outside of the end product into which the H330 Module is incorporated, with a statement similar to the following: For H330: This device contains FCC ID: ZMOH330.

5. A user manual with the end product must clearly indicate the operating requirements and conditions that must be observed to ensure compliance with current FCC RF exposure guidelines.

The end product with an embedded H330 Module may also need to pass the FCC Part 15 unintentional emission testing requirements and be properly authorized per FCC Part 15.

Note: If this module is intended for use in a portable device, you are responsible for separate approval to satisfy the SAR requirements of FCC Part 2.1093.

FCC NOTICE:
Changes or modifications made to this equipment not expressly approved by Shenzhen G&T Industrial Development Co., Ltd. may void the FCC authorization to operate this equipment.