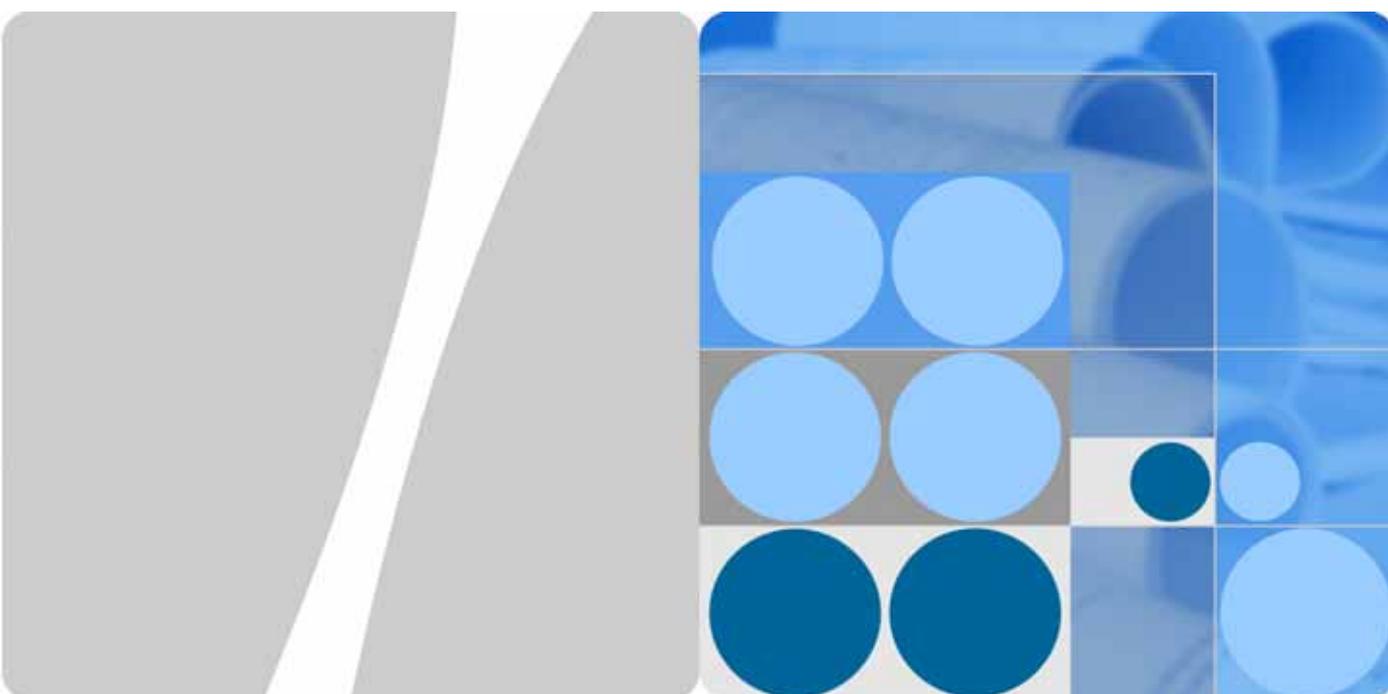


Product Description



UM01-HW UMTS Wireless Module
V100R001



Issue 1.00
Date 2009-9-10

HUAWEI TECHNOLOGIES CO., LTD.

Huawei Technologies Co., Ltd. provides customers with comprehensive technical support and service. Please feel free to contact our local office or company headquarters.

Huawei Technologies Co., Ltd.

Address: Huawei Industrial Base
Bantian, Longgang
Shenzhen 518129
People's Republic of China

Website: <http://www.huawei.com>

Email: support@huawei.com

Copyright © Huawei Technologies Co., Ltd. 2009. All rights reserved.

No part of this document may be reproduced or transmitted in any form or by any means without prior written consent of Huawei Technologies Co., Ltd.

Trademarks and Permissions



and other Huawei trademarks are trademarks of Huawei Technologies Co., Ltd. All other trademarks and trade names mentioned in this document are the property of their respective holders.

Notice

The information in this document is subject to change without notice. Every effort has been made in the preparation of this document to ensure accuracy of the contents, but all statements, information, and recommendations in this document do not constitute the warranty of any kind, express or implied.



About This Document

History

Issue	Details	Date	Author	Approved by
V1.00	Initial formal release.	2009-9-10	Yang Chunfan	zhou Zhaoxing

Contents

1 Product Overview	9
1.1 About This Chapter	9
1.2 Functions of the UM01-HW UMTS Module	9
1.3 Application Block Diagram of the UM01-HW UMTS Module	11
2 Interface Description.....	12
2.1 About This Chapter	12
2.2 Signal Connector Interface.....	12
2.2.1 Interface Signals.....	12
2.3 Antenna Interfaces.....	16
2.3.1 Antenna Interface Circuits	16
3 Electrical Features of the Interfaces.....	18
3.1 About This Chapter	18
3.2 Application Extremes	18
3.3 Operating and Storage Temperature	19
3.4 Levels of the I/O Interface	19
3.5 Power Supply Features.....	20
3.5.1 Input Power Supply.....	20
3.5.2 Operating Current	20
3.5.3 Power-on, Power-off, and Reset Processes	21
3.5.4 RTC Power Supply	22
3.6 Reliability Features	23
3.7 ESD Features.....	24
3.7.1 Overview.....	24
3.7.2 ESD Protection on the Antenna Interface	25
3.7.3 ESD Protection on the USIM Card Interface	25
4 Interface Applications.....	26
4.1 About This Chapter	26
4.2 UART Interface	26
4.3 USIM Card Interface.....	28
4.4 Audio Interfaces	30
4.5 Power Supply Interface	31
4.6 USB Bus.....	32



4.7 ADC Interfaces	32
4.8 Status Indication Pins	33
4.9 Pin Sequence	33
5 Mechanics	34
5.1 Overview	34
5.2 Mechanical Dimensions of the UM01-HW UMTS Module	34
5.3 Mechanical Dimensions of the B2B Connector	36
A Acronyms and Abbreviations.....	39

Figures

Figure 1-1 Application block diagram of the UM01-HW UMTS module.....	11
Figure 2-1 Dimensions of the RF connector.....	16
Figure 2-2 RF connector.....	17
Figure 3-1 Power-on process of the UM01-HW UMTS module.....	21
Figure 3-2 Normal power-off process of the UM01-HW UMTS module	22
Figure 3-3 Reset process of the UM01-HW UMTS module	22
Figure 3-4 Recommended circuit for the ESD protection on the antenna interface	25
Figure 3-5 Recommended circuit for ESD protection on the USIM card interface.....	25
Figure 4-1 Connections between the DCE and DTE.....	27
Figure 4-2 Connections between the serial interface and the 3 V single-chip microcontroller	28
Figure 4-3 Circuits of the USIM card interface.....	29
Figure 4-4 Sequence of the pins of the USIM card	29
Figure 4-5 Sequence of the pins of a USIM card seat	29
Figure 4-6 Circuits of the first audio interface	31
Figure 4-7 Connections between the UM01-HW UMTS module and the 8-ohm speaker	31
Figure 4-8 Reference circuits of the design of the ADC interfaces	32
Figure 4-9 Sequence of the pins on the UM01-HW UMTS module	33
Figure 5-1 Mechanical dimensions of the UM01-HW UMTS module (unit: mm)	35
Figure 5-2 HRS DF12(3.0)-60DS-0.5V(86) connector on the UM01-HW UMTS module	36
Figure 5-3 HRS DF12(3.0)-60DP-0.5V(86) mating header on the user board.....	36
Figure 5-4 Dimensions of the connector on the UM01-HW UMTS module (unit: mm)	37
Figure 5-5 Dimensions of the connector pad on the user interface board of the UM01-HW UMTS module	38

Tables

Table 1-1 Product features	9
Table 2-1 Functions of the signals on the signal connector interface	12
Table 3-1 Extreme application values of the UM01-HW UMTS module	18
Table 3-2 Temperature ranges of the UM01-HW UMTS module	19
Table 3-3 Levels of the I/O interfaces on the UM01-HW UMTS module ($V_{DD_PX} = 2.6\text{ V}$).....	19
Table 3-4 Input power supply range of the UM01-HW UMTS module	20
Table 3-5 Operating current of the UM01-HW UMTS module (TBD).....	20
Table 3-6 VCOIN pin for the input of the RTC power supply.....	23
Table 3-7 Parameters of the RTC power supply pin	23
Table 3-8 Conditions and results of the part mechanical reliability tests.....	23
Table 3-9 ESD performance	24
Table 4-1 Signals on UART1 of the UM01-HW UMTS module	27
Table 4-2 Pins of the USIM card interface	28
Table 4-3 Signals of the audio interfaces.....	30
Table 4-4 Signals of the USB interface.....	32
Table 5-1 DF12 series that are compatible with the UM01-HW UMTS module	37

1 Product Overview

1.1 About This Chapter

This chapter provides an overview of the UM01-HW UMTS module, with the following information included:

- Functions of the UM01-HW UMTS Module
- Application Block Diagram of the UM01-HW UMTS Module

1.2 Functions of the UM01-HW UMTS Module

The UM01-HW UMTS module has the following functions:

- Supporting the frequency bands of UMTS 2100 MHz and UMTS 850 MHz
- Supporting voice, short message, data, and supplementary services
- Providing various user signal interfaces including the following:
 1. Power supply interface
 2. One 9-wire serial interface
 3. Two analog audio interfaces
 4. One USIM card interface (supporting the 3.0 V USIM card or 1.8 V USIM card)
 5. One full-speed Universal Serial Bus (USB) 2.0 interface
 6. Two Analog-to-Digital Converter (ADC) interfaces
- Providing two kinds of antenna interfaces: antenna pad and antenna connector
- Supporting the standard AT command set and the extended AT command set of Huawei
- Complying with the Restriction of Hazardous Substances (RoHS) certification

Table 1-1 shows the features of the UM01-HW UMTS module.

Table 1-1 Product features

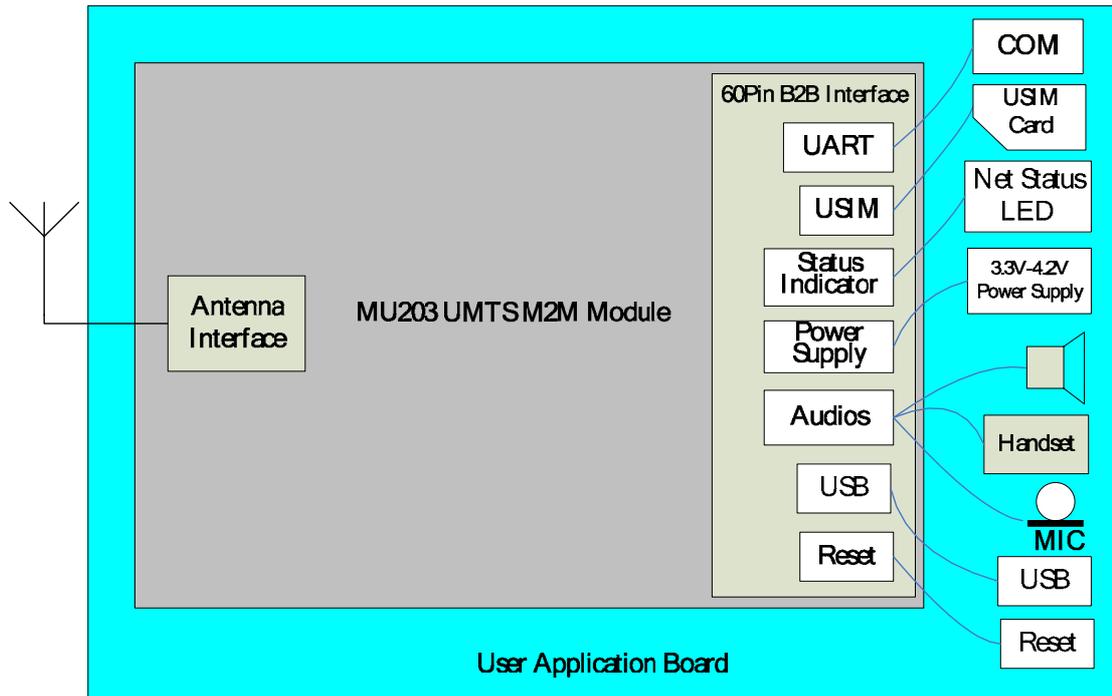
Product Feature	Description
Frequency bands	UMTS: Double bands including 2100 MHz and 850 MHz
	GSM: quad bands including 850/900/1900/2100MHz

Product Feature	Description
Maximum transmit power	Class 4 (+33dBm ±2dB) for EGSM/GPRS 850 Class 4 (+33dBm ±2dB) for EGSM/GPRS 900 Class 1 (+30dBm ±2dB) for GSM/GPRS 1800 Class 1 (+30dBm ±2dB) for GSM/GPRS 1900 Class 3 (+24dBm +1/-3dB) for UMTS 2100, WCDMA FDD BdI Class 3 (+24dBm +1/-3dB) for UMTS 850, WCDMA FDD BdV
Operating temperature	Normal operation temperature: - 20°C to +75°C
	Extended operation temperature: - 40°C to +85°C
	Storage temperature: - 40°C to +90°C
Power supply voltage	3.4 V to 4.2 V (The voltage of 3.8 V is recommended.)
Power consumption (current)	Shutdown mode: < 10 uA
	Standby mode: < TBD mA
	Operating current under the maximum power consumption: < 500 mA
AT commands	Standard AT command set Extended AT command set of Huawei
60-pin board-to-board (BTB) connector	One 9-wire Universal asynchronous receiver-transmitter (UART) interface
	One standard USIM card interface (1.8 V or 3 V)
	Eight GPIO interfaces
	One hardware reset interface
	Two analog audio interfaces
	Two ADC interfaces
	Power supply interface
Antenna interfaces	Supporting the main antenna interface
	HRS U.FL-R-SMT-1(10) RF connector and antenna pad
Voice services	FR, EFR, HR, and AMR voice coding
Short message service (SMS)	Mobile Originated (MO) and Mobile Terminated (MT)
	Point-to-point broadcast and cell broadcast
	Short messages in text mode and PDU mode
Supplementary services	Caller ID display, call forwarding, call holding, call waiting, and three-way calling
Physical characteristics	Dimensions: 31 mm x 45 mm x 5.4 mm Weight: 9.8±0.2 g

1.3 Application Block Diagram of the UM01-HW UMTS Module

Figure 1-1 shows the application block diagram of the UM01-HW UMTS module.

Figure 1-1 Application block diagram of the UM01-HW UMTS module



2 Interface Description

2.1 About This Chapter

This chapter describes the signal interfaces of the UM01-HW UMTS module, with the following interfaces included:

- Signal Connector Interface
- Antenna Interfaces

2.2 Signal Connector Interface

2.2.1 Interface Signals

The UM01-HW UMTS module adopts the 60-pin B2B connector as the external signal interface.

Table 2-1 shows the functions of the signals on the signal connector interface of the UM01-HW UMTS module.

Table 2-1 Functions of the signals on the signal connector interface

No.	Signal Name	IO	Function	Remarks
1	VBAT	P	Power supply input	The voltage ranges from 3.3 V to 4.2 V. The voltage of 3.8 V is recommended.
2	GND	P	Ground	
3	VBAT	P	Power supply input	The voltage ranges from 3.3 V to 4.2 V. The voltage of 3.8 V is recommended.
4	GND	P	Ground	

No.	Signal Name	IO	Function	Remarks
5	VBAT	P	Power supply input	The voltage ranges from 3.3 V to 4.2 V. The voltage of 3.8 V is recommended.
6	GND	P	Ground	
7	VBAT	P	Power supply input	The voltage ranges from 3.3 V to 4.2 V. The voltage of 3.8 V is recommended.
8	GND	P	Ground	
9	VBAT	P	Power supply input	The voltage ranges from 3.3 V to 4.2 V. The voltage of 3.8 V is recommended.
10	GND	P	Ground	
11	MODE_LED	AO	Mode indicator	Current driver output, connect LED cathode.
12	VCOIN	P	Input of the backup power supply	This pin is connected to a button-type battery or a capacitor.
13	STATUS_LED	AO	Status indicator	Current driver output, connect LED cathode.
14	VREG_MSMP	P	Output of the 2.6 V voltage	This pin provides voltage for peripherals. See Note.
15	NC	-	-	This pin must be suspended.
16	RESET_N	DI	Reset	Low-level signals are valid for this pin.
17	NC	-	-	This pin must be suspended.
18	POWER_ON_OFF	DI	Power-on and Power-off	Low-level signals are valid for this pin.
19	NC	-	-	This pin must be suspended.
20	UART1_XCS	DO	Request To Send signal of UART1	
21	NC	-	-	This pin must be suspended.
22	UART1_XCI	DO	Ringing signal of UART1	

No.	Signal Name	IO	Function	Remarks
23	UART1_SD	DI	Send Data signal of UART1	
24	UART1_XDR	DO	Data set ready signal of UART1	
25	NC	-	-	This pin must be suspended.
26	UART1_XRS	DI	Clear to Send signal of UART1	
27	UART1_RD	DO	Receive Data signal of UART1	
28	UART1_XER	DI	Data terminal ready signal of UART1	
29	NC	-	-	This pin must be suspended.
30	UART1_XCD	DO	Data carrier detect signal of UART1	
31	NC	-	-	This pin must be suspended.
32	FOTA_N	DO	FOTA status indicator	Default internal pull up
33	NC	-	-	This pin must be suspended.
34	WAKEUP_SL EEP_IN	DI	Sleep and wakeup the module by the host	Default internal pull up, Low-level signals are valid for this pin.
35	NC	-	-	This pin must be suspended.
36	USB_D-	IO	Negative USB signal	
37	NC	-	-	This pin must be suspended.
38	USB_D+	IO	Positive USB signal	
39	NC	-	-	This pin must be suspended.
40	WAKEUP_SL EEP_OUT	DO	Signal to sleep and wake up the host by the module	Default internal pull up
41	NC	-	-	This pin must be suspended.
42	USIM_CLK	DO	Clock signal of the USIM interface	

No.	Signal Name	IO	Function	Remarks
43	NC	-	-	This pin must be suspended.
44	VREG_USIM	P	Power supply of the USIM interface	1.8V/2.85V
45	NC	-	-	This pin must be suspended.
46	USIM_IO	IO	Data signal of the USIM interface	
47	EAR1_N	AO	Negative pole of the output of the first audio interface	Connect 32ohm
48	USIM_RST	DO	Reset signal of the USIM interface	
49	EAR1_P	AO	Positive pole of the output of the first audio interface	Connect 32ohm
50	NC	-	-	This pin must be suspended.
51	MIC1_N	AI	Negative pole of the input of the first audio interface	See section 4.4 "Audio Interfaces."
52	GND	P	Ground	
53	MIC1_P	AI	Positive pole of the input of the first audio interface	
54	SPKR_OUT_N	AO	Negative pole of the output of the second audio interface	Connect 8ohm
55	GND	P	Ground	
56	SPKR_OUT_P	AO	Positive pole of the output of the second audio interface	Connect 8ohm
57	ADC_1	AI	Input of the first ADC interface	The input voltage ranges from 0 V to 2.6 V.
58	MIC2_N	AI	Negative pole of the input of the second audio interface	
59	ADC_2	AI	Input of the second ADC interface	The input voltage ranges from 0 V to 2.6 V.
60	MIC2_P	AI	Positive pole of the input of the second audio interface	

Note: The MSMP pin exports the voltage of 2.6 V and the current of 50 mA.

2.3 Antenna Interfaces

2.3.1 Antenna Interface Circuits

The UM01-HW UMTS module supports the main antenna interface .Antenna interface is connected to antenna through the RF connector and the antenna pad. Either of the antenna interfaces can be selected for use. The selected cable and antenna must have an impedance of 50 ohm.

The UM01-HW UMTS module adopts the U.FL-R-SMT-1(10) RF connector 51-3612-50-H supplied by HRS. Figure 2-1 shows the dimensions of the RF connector.

Figure 2-1 Dimensions of the RF connector

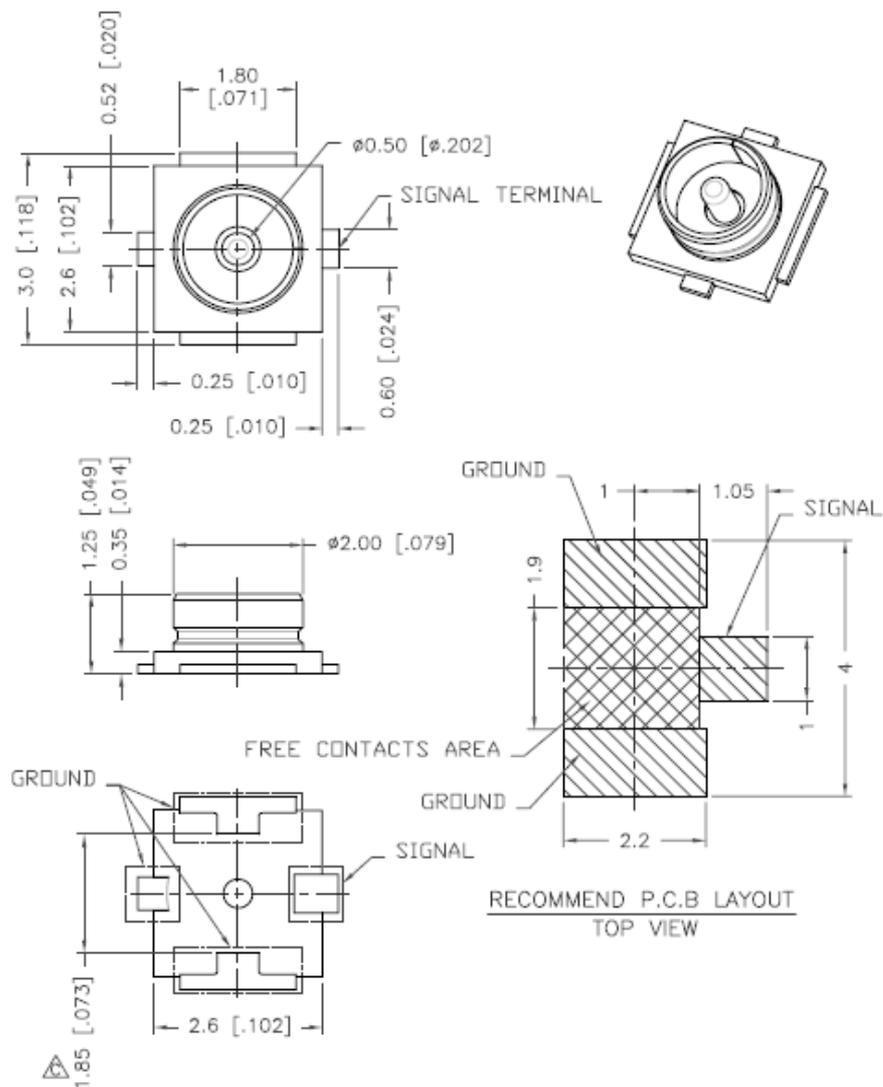
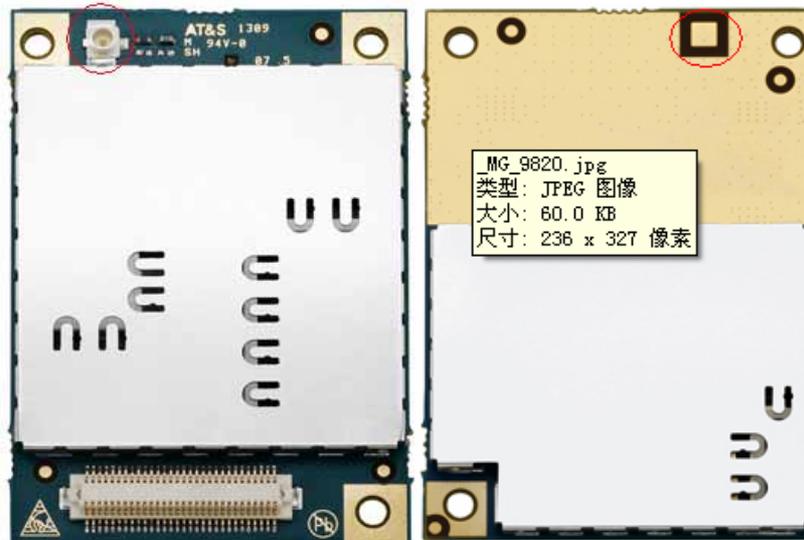


Figure 2-2 shows the RF connector. The interface on the RF connector are pointed by the red arrows. The antenna pad is located at the bottom of the RF connector. A coaxial cable can be soldered on the antenna pad for connecting an external antenna to the UM01-HW UMTS module.

The RF connector and antenna pad can only be applied alternatively. When using the antenna pad, make sure that the surface of the soldering points is smooth to reduce the impact of the soldering on RF signals.

Figure 2-2 RF connector



The antenna whose gain value is less than 1 dBi is recommended.

According to the cabling of the circuit board, adjust the reference value of each component. You can connect an inductor of 68 nH to 100 nH for electrostatic discharge (ESD) protection to the ground. Pay attention to the impedance matching and ESD protection capability or lightning protection capability of the antenna.

3 Electrical Features of the Interfaces

3.1 About This Chapter

This chapter describes the electrical features of the interfaces of the UM01-HW UMTS, with the following features included:

- Application Extremes
- Operating and Storage Temperature
- Levels of the I/O Interface
- Power Supply Features
- Reliability Features
- ESD Features



NOTE

This chapter describes mainly the electrical features of the external interfaces of the UM01-HW UMTS module.

3.2 Application Extremes

Table 3-1 shows the extreme application values of the UM01-HW UMTS module. Exceeding these values will cause permanent damage to the UM01-HW UMTS module.

Table 3-1 Extreme application values of the UM01-HW UMTS module

Parameter	Description	Minimum Value	Maximum Value	Unit
VBAT	Input voltage of the UM01-HW UMTS module	- 0.5	5.0	V
VIN	Input voltage of the I/O interface	- 0.5	5.0	V

3.3 Operating and Storage Temperature

Table 3-2 shows the temperature ranges of the UM01-HW UMTS module.

Table 3-2 Temperature ranges of the UM01-HW UMTS module

Parameter	Minimum Value	Maximum Value	Unit
Normal operating temperature	- 20	75	°C
Extended operating temperature	- 40	85	°C
Storage temperature	- 40	90	°C

3.4 Levels of the I/O Interface

Table 3-3 shows the levels of the I/O interfaces on the UM01-HW UMTS module.

Table 3-3 Levels of the I/O interfaces on the UM01-HW UMTS module ($V_{DD_PX} = 2.6\text{ V}$)

Parameter	Description	Minimum Value	Maximum Value	Unit
V_{IH}	High-level input voltage	$0.65 \times V_{DD_PX}$	$V_{DD_PX} + 0.3$	V
V_{IL}	Low-level input voltage	- 0.3	$0.35 \times V_{DD_PX}$	V
V_{OH}	High-level output voltage	$V_{DD_PX} - 0.45$	V_{DD_PX}	V
V_{OL}	Low-level output voltage	0	0.45	V
I_{IH}	Current leakage during high-level input	-	1	μA
I_{IL}	Current leakage during low-level input	- 1	-	μA
C_{IN}	Input capacitance	-	7	pF

3.5 Power Supply Features

3.5.1 Input Power Supply

Table 3-4 shows the input power supply range of the UM01-HW UMTS module.

Table 3-4 Input power supply range of the UM01-HW UMTS module

Parameter	Minimum Value	Typical Value	Maximum Value	Unit
VBAT	3.3	3.8	4.2	V



CAUTION

The time when any interface on the UM01-HW UMTS module is powered on must not be earlier than the time when the module is powered on. Otherwise, the UM01-HW UMTS module may be abnormal or damaged.

3.5.2 Operating Current

Table 3-5 shows the operating current of the UM01-HW UMTS module.

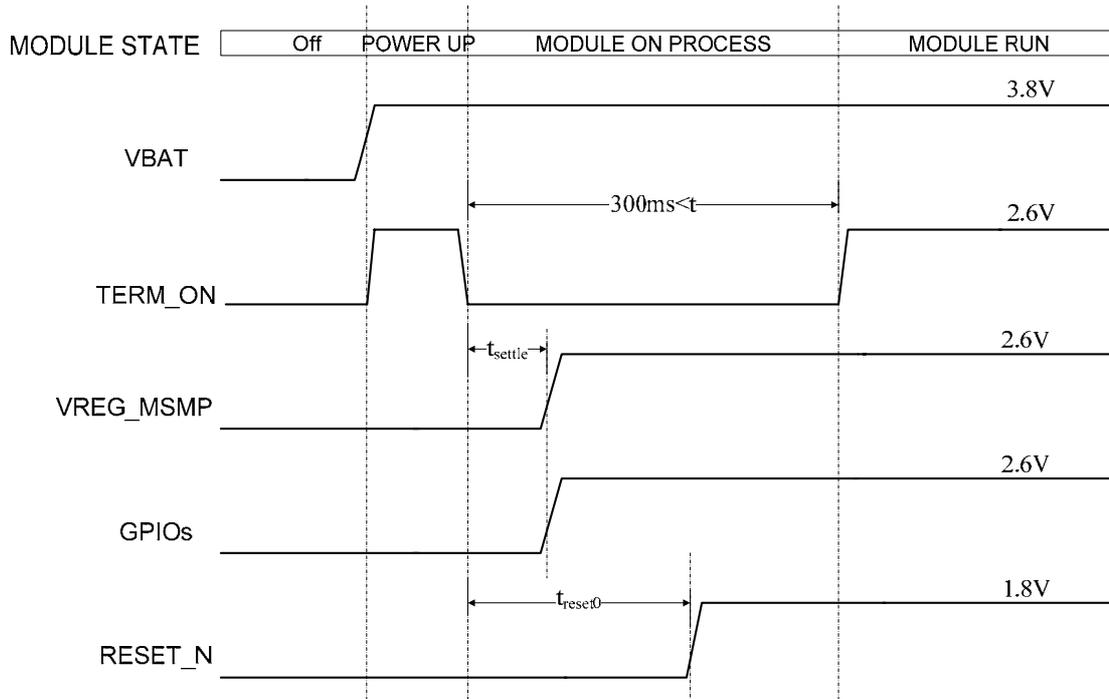
Table 3-5 Operating current of the UM01-HW UMTS module (TBD)

Operating Mode	Minimum Value	Typical Value	Maximum Value	Unit
WCDMA Idle state	42.7	42.9	43.8	mA
WCDMA data transmission state	-	490	-	mA
Off state	-	100	-	μA

3.5.3 Power-on, Power-off, and Reset Processes

When the voltage of the power supplied to the UM01-HW UMTS module is higher than 3.3 V and the TERM_ON pin is driven low for at least 300 ms, the UM01-HW UMTS module can be powered on. Figure 3-1 shows the power-on process of the UM01-HW UMTS module.

Figure 3-1 Power-on process of the UM01-HW UMTS module



CAUTION

If the power supply with the lower voltage (for example 3.3 V) is used, the antenna interfaces need to be configured. The cable connecting the external power supply and the module should be as short as possible and the power supply input should be configured with a capacitor of higher than 1000 μ F. Otherwise, the voltage that is actually imported to the UM01-HW UMTS module may be lower than 3.3 V, resulting in the deterioration of RF indicators and unstable operation of the UM01-HW UMTS module.

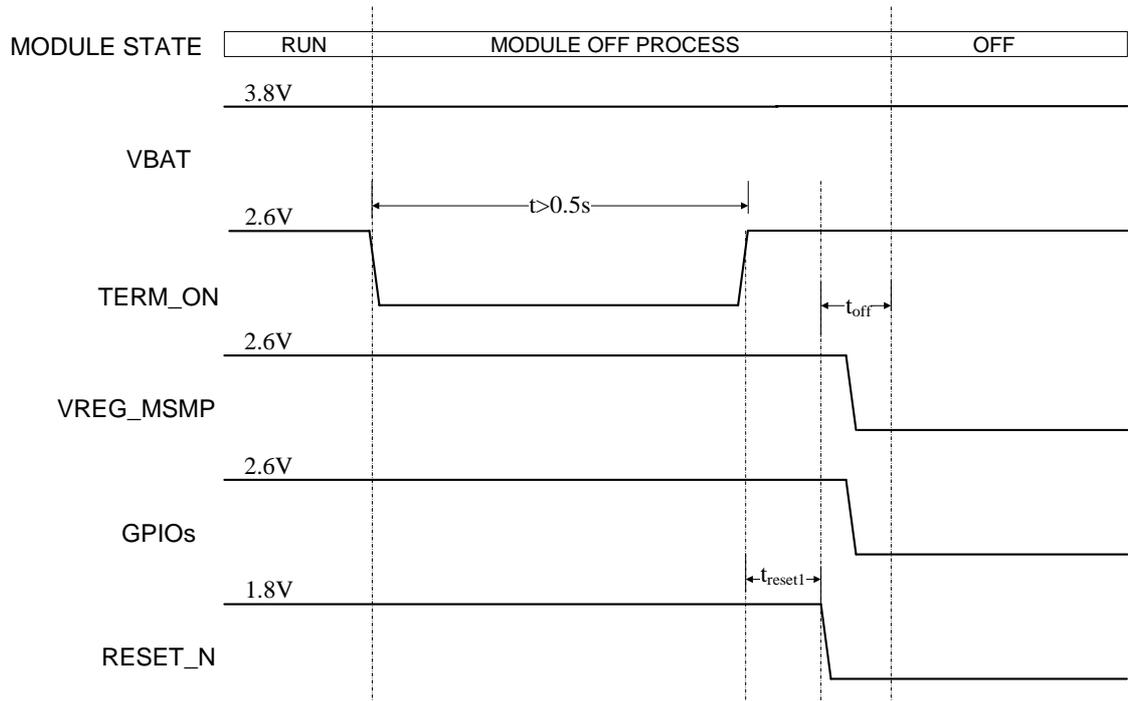
The power-off process is classified into normal power-off and urgent power-off.

Normal power-off

An external CPU drives the TERM_ON pin low for more than 0.5s. Then, the UM01-HW UMTS module is normally powered off. During the normal power-off process, the UM01-HW UMTS module can save information and log out of the network.

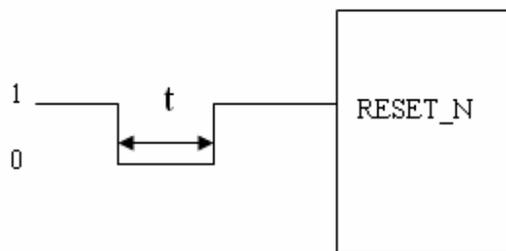
Figure 3-2 shows the normal power-off process.

Figure 3-2 Normal power-off process of the UM01-HW UMTS module



When the RESET_N pin is driven low for 100 ms, the UM01-HW UMTS module can be reset. Figure 3-3 shows the reset process of the UM01-HW UMTS module.

Figure 3-3 Reset process of the UM01-HW UMTS module



Note: The RESET_N pin is sensitive to interference. Therefore, the lines on the interface board of the UM01-HW UMTS module should be not longer than 2 cm. Otherwise, the UM01-HW UMTS module may be reset because of interference.

3.5.4 RTC Power Supply

The power supply pin for the real-time clock (RTC) can obtain current from the VBAT pin through software enabling to charge the backup battery of the RTC. The power supply input is monitored by a CPU.

The UM01-HW UMTS module defines the VCOIN pin for the input of the backup power supply on the 60-pin B2B connector to implement the power supply input for the RTC.

Table 3-6 VCOIN pin for the input of the RTC power supply

PIN	Name	I/O	Function	Remarks
12	VCOIN	P	Input of the backup power supply	This pin is connected to a button-type battery or a capacitor of large capacitance.

If the RTC backup battery is not used, you can connect the pin to the primary power supply, or use an electrolytic capacitor of large capacitance.

Table 3-7 Parameters of the RTC power supply pin

Parameter	Comments	Min	Typ	Max	Units
Target regulator voltage ¹	$V_{IN} > 3.3 \text{ V}$, $I_{CHG} = 100 \mu\text{A}$	3.00	3.10	3.20	V
Target series resistance ²		800		2100	Ω
Coin cell charger voltage error	$I_{CHG} = 0 \mu\text{A}$	-5		+5	%
Coin cell charger resistor error		-20		+20	%
Ground current, charger enabled	PMIC = off; VCOIN = open; VBAT = 3.7 V		4.5	8	μA

3.6 Reliability Features

Table 3-8 shows the conditions and results of the part mechanical reliability tests performed on the UM01-HW UMTS module.

Table 3-8 Conditions and results of the part mechanical reliability tests

Test Item	Test Condition	Test Standard
Random vibration	Frequency range: 5 Hz to 20 Hz, PSD: $1.0 \text{ m}^2/\text{s}^3$; Frequency range: 20 Hz to 200 Hz, -3 dB/oct; Three axial directions with one hour for each direction	IEC 68-2-6
Shock test	Half sine wave shock Acceleration: 20 g Shock period: 11 ms Six axial directions with one shock in each direction ($\pm x$, y , and z)	TIA/EIA 603 3.3.5 GB/T15844.2 4.1

Test Item	Test Condition	Test Standard
Temperature shock	Low temperature: $-40^{\circ}\text{C}\pm 2^{\circ}\text{C}$ High temperature: $85^{\circ}\text{C}\pm 2^{\circ}\text{C}$ Changeover time: < 30s Test duration: 1 hour Repetition times: 100	IEC 68-2-14 Na
Damp heat cyclic	High temperature: $55^{\circ}\text{C}\pm 2^{\circ}\text{C}$ Low temperature: $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$ Humidity: 95% Repetition times: 4 Test duration: 12 hours + 12 hours	IEC 68-2-30 Db
Low-temperature operation	Temperature: $-30^{\circ}\text{C}\pm 2^{\circ}\text{C}$ Test period: 24 hours	IEC 68-2-1 Ab
High-temperature operation	Temperature: $75^{\circ}\text{C}\pm 2^{\circ}\text{C}$ Test period: 24 hours	IEC 68-2-2 Bb
Low-temperature storage	Temperature: $-60^{\circ}\text{C}\pm 2^{\circ}\text{C}$ Test period: 24 hours	IEC 68-2-1 Ab
High-temperature storage	Temperature: $90^{\circ}\text{C}\pm 2^{\circ}\text{C}$ Test period: 24 hours	IEC 68-2-2 Bb
Salt spray test	Temperature: 35°C Density of the NaCl solution: $5\%\pm 1\%$ Spraying duration: 48 hours Duration of exposing the module to the temperature of 35°C : 16 hours	IEC 68-2-11

3.7 ESD Features

3.7.1 Overview

When the UM01-HW UMTS module is in use, the ESD protection should be considered. The ESD performance of the UM01-HW UMTS module has been tested according to the EN61000-4-2 standard. Table 3-9 shows the test results.

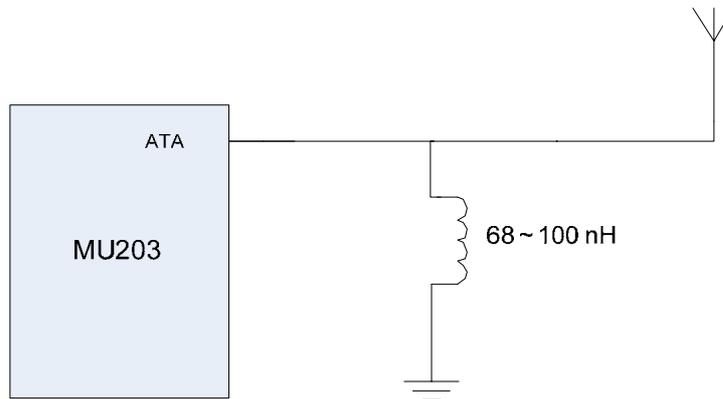
Table 3-9 ESD performance

Interface	Air Discharge	Contact Discharge
USIM card interface	$\pm 8\text{K V}$	$\pm 4\text{K V}$
USB interface	$\pm 8\text{K V}$	$\pm 4\text{K V}$

3.7.2 ESD Protection on the Antenna Interface

The antenna interface of the UM01-HW UMTS module is sensitive to ESD. Poor ESD protection may cause permanent damage to internal RF components. Figure 3-4 shows the recommended circuit for the ESD protection on the antenna interface.

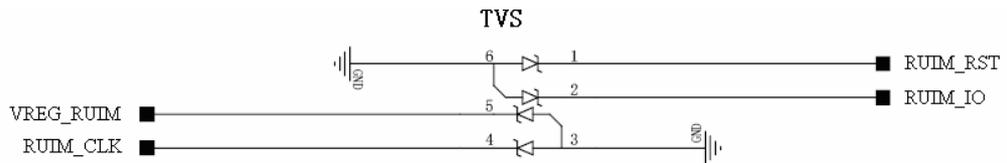
Figure 3-4 Recommended circuit for the ESD protection on the antenna interface



3.7.3 ESD Protection on the USIM Card Interface

Figure 3-5 shows the recommended circuit for the ESD protection on the USIM card interface of the UM01-HW UMTS module. The transient voltage suppressor (TVS) diode should be placed as close to the USIM card seat as possible.

Figure 3-5 Recommended circuit for ESD protection on the USIM card interface



4 Interface Applications

4.1 About This Chapter

This chapter describes the applications of the interfaces of the UM01-HW UMTS module, with the following interfaces included:

- UART Interface
- USIM Card Interface
- Audio Interfaces
- Power Supply Interface
- USB Bus
- ADC Interfaces
- Status Indication Pins
- Pin Sequence

4.2 UART Interface

The UM01-HW UMTS module has one UART interface, that is, UART1. UART1 is a 9-wire serial interface supporting the flow control function and a maximum transmission rate of 230.4kbit/s.

UART1 supports data services. You can set up the Point-to-Point Protocol (PPP) dial-up connection for data services through UART1.

UART1 supports programmable data width, data stop bit, and parity check (or no parity check). In addition, UART1 supports a maximum baud rate of 230.4 kbps and a default baud rate of 115.2 kbps. The set baud rate can be saved even if the interface is powered off.

Figure 4-1 Connections between the DCE and DTE

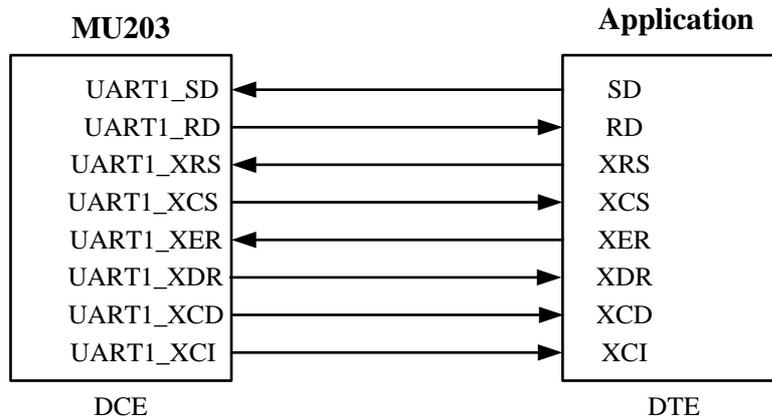


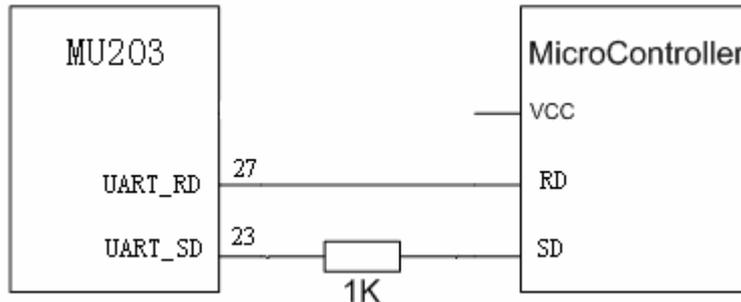
Table 4-1 shows the definitions of the interface signals.

Table 4-1 Signals on UART1 of the UM01-HW UMTS module

Pin Number	Signal Name	Description	Feature	Direction
27	UART1_RD	Data transmission end of the module	The Data Terminal Equipment (DTE) receives serial data.	DCE - DTE
23	UART1_SD	Data receiving end of the module	The DTE transmits serial data.	DTE - DCE
22	UART1_XCI	Ringing indication of the module	The DTE is notified of a remote call.	DCE - DTE
20	UART1_XCS	This device's permission to send	The DTE notifies the Data Communications Equipment (DCE) of sending requests.	DCE - DTE
28	UART1_XER	DTE ready signal	The DTE is ready.	DTE - DCE
24	UART1_XDR	This device's ready signal	The DCE is ready.	DCE - DTE
26	UART1_XRS	DTE send request signal	The DCE switches to the receiving mode.	DTE - DCE
30	UART1_XCD	Carrier detection signal	Data links are connected.	DCE - DTE

The UM01-HW UMTS module is connected to a 3 V single-chip microcontroller. You need to add a 1000-ohm resistor between the two SD pins.

Figure 4-2 Connections between the serial interface and the 3 V single-chip microcontroller



You can use a Category 232 chip to connect the UM01-HW UMTS module to a standard RS-232-C interface. In the case of a 3-wire serial interface, the MAX3232 chip is recommended. The UART1-SD pin of the module connects to the SD pin of the DTE after being converted through the MAX3232 chip, and the RD pin of the DTE connects to the UART1_RD pin of the module after being converted through the MAX232 chip.

4.3 USIM Card Interface

The UM01-HW UMTS module can connect to a 3V or a 1.8V USIM card. Table 4-2 shows the signals of the USIM card interface. The level of the USIM card interface is 3 V or 1.8 V.

Table 4-2 Pins of the USIM card interface

Pin Number	Signal Name	Description
44	VREG_USIM	Power supply of the USIM card
48	USIM_RST	Reset signal of the USIM card
42	USIM_CLK	Clock signal of the USIM card
46	USIM_IO	Data signal of the USIM card
	GND	Ground

Figure 4-3 Circuits of the USIM card interface

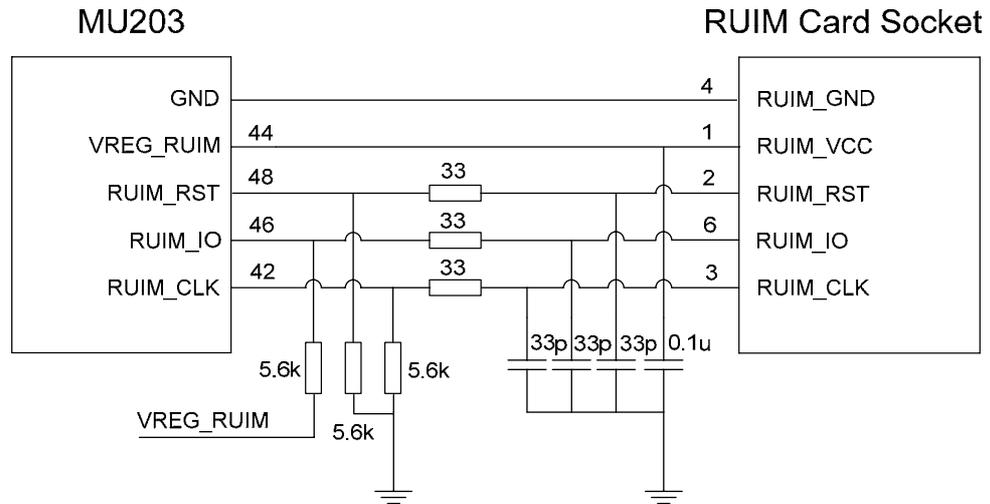


Figure 4-4 Sequence of the pins of the USIM card

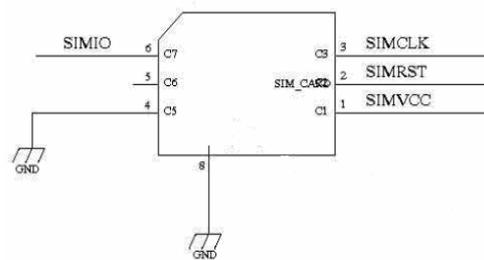
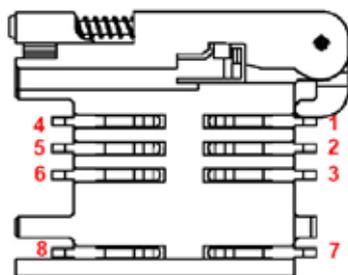


Figure 4-5 Sequence of the pins of a USIM card seat



The typical rate of the USIM card interface is about 3.25 MHz. Therefore, the USIM card seat should be as close to the module interface as possible and the line should not exceed 10 cm. This prevents the communications quality of signals from being affected by serious waveform distortion because of too long lines. Ground lines should be used to enclose the lines used for transmitting USIM_CLK signals and USIM_IO signals.

To filter out the interference from antenna signals, you need to add a 0.1 μ F or a 0.22 μ F capacitor to the USIM_VCC signal and a 33 pF capacitor to the USIM_CLK, USIM_IO, and USIM_RST signals based on the GND network. In addition, you need to add TVS diodes to

these four signals for ESD protection. The TVS diodes should be placed as close to the USIM card seat as possible.

4.4 Audio Interfaces

The UM01-HW UMTS module provides two audio input/output (I/O) interfaces. Table 4-3 shows the signals of the audio interfaces.

Table 4-3 Signals of the audio interfaces

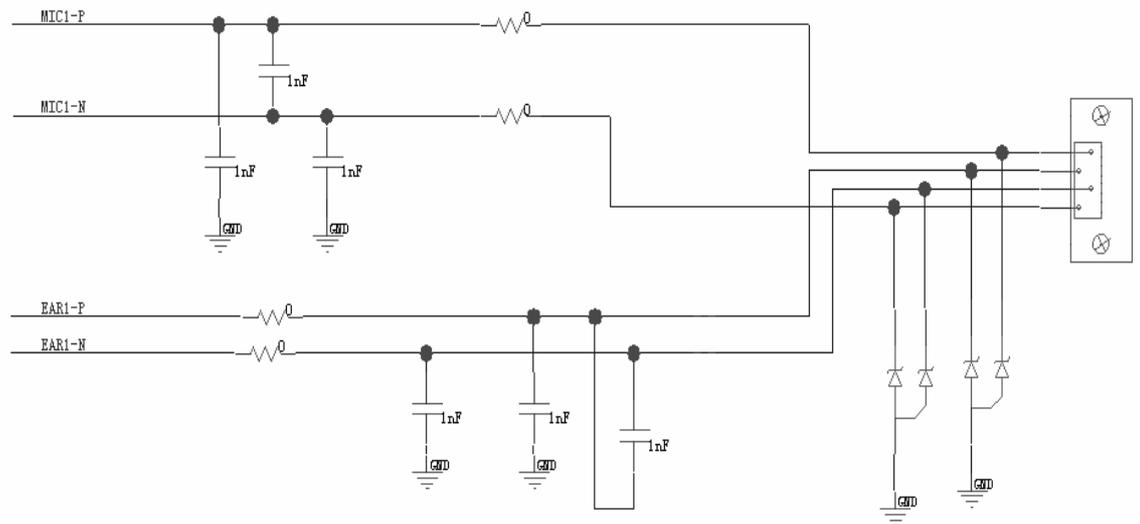
Pin Number	Signal Name	Description
51	MIC1_N	Negative pole of the input of the first audio interface
53	MIC1_P	Positive pole of the input of the first audio interface
47	EAR1_N	Negative pole of the output of the first audio interface
49	EAR1_P	Positive pole of the output of the first audio interface
58	MIC2_N	Negative pole of the input of the second audio interface
60	MIC2_P	Positive pole of the output of the second audio interface
54	SPKR_OUT_N	Negative pole of the output of the second audio interface
56	SPKR_OUT_P	Positive pole of the output of the second audio interface

The input and output signals on the first audio interface are fully differential and thus have good performance of resisting RF interference. This audio interface can be used in handset connection mode without any external audio frequency amplifier (AFA).

If audio signals are in differential pairs, the lines on the printed circuit board (PCB) should be equidistantly laid in parallel with each other. The lines should be short, the filter circuits of the two sides should be symmetric, the differential pair signals should be close to each other, and the grounding is required. The differential pair signals of the audio output and the differential pair signals of the audio output should be effectively separated through grounding. In addition, the signals should be away from the circuits of the power supply, RF, and antenna.

Differentiate and isolate functional modules during PCB design of the UM01-HW UMTS module.

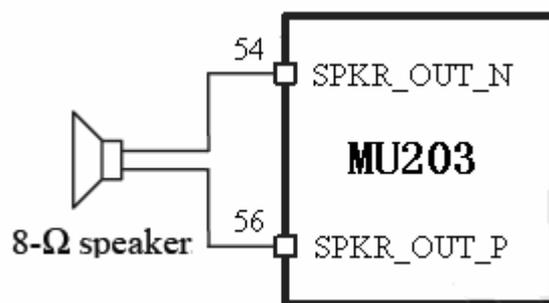
Figure 4-6 Circuits of the first audio interface



Differential signals are transmitted on the first audio interface. By reserving a place for the resistor in the loop, you can adjust the quality and volume of the voice. It is recommended that you place a TVS on the related interface to provide protection against ESD and protect components such as the internal integrated circuit (IC) component.

The output signals of the second audio interface can directly drive an 8-ohm speaker.

Figure 4-7 Connections between the UM01-HW UMTS module and the 8-ohm speaker



4.5 Power Supply Interface

An external power supply with the voltage of 3.3 V to 4.2 V (the typical value is 3.8 V) powers the UM01-HW UMTS module through the VBAT pin. When the network signals are weak, the antenna transmits signals with the highest power and the maximum transient current is up to 1.6 A. In this case, it is recommended that you use a low dropout (LDO) regulator or a switching-mode power supply whose current is higher than 1.6 A.

Considering the voltage drop that may occur during the transmission with high power, you can add a large capacitor on the power supply interface of the module. The electrolytic capacitor of over 220 μF is recommended.

4.6 USB Bus

Working with the drives of a PC, the USB interface can be mapped to a serial interface of the PC. The USB interface is mainly used for updating module applications, capturing software logs, and testing module applications.

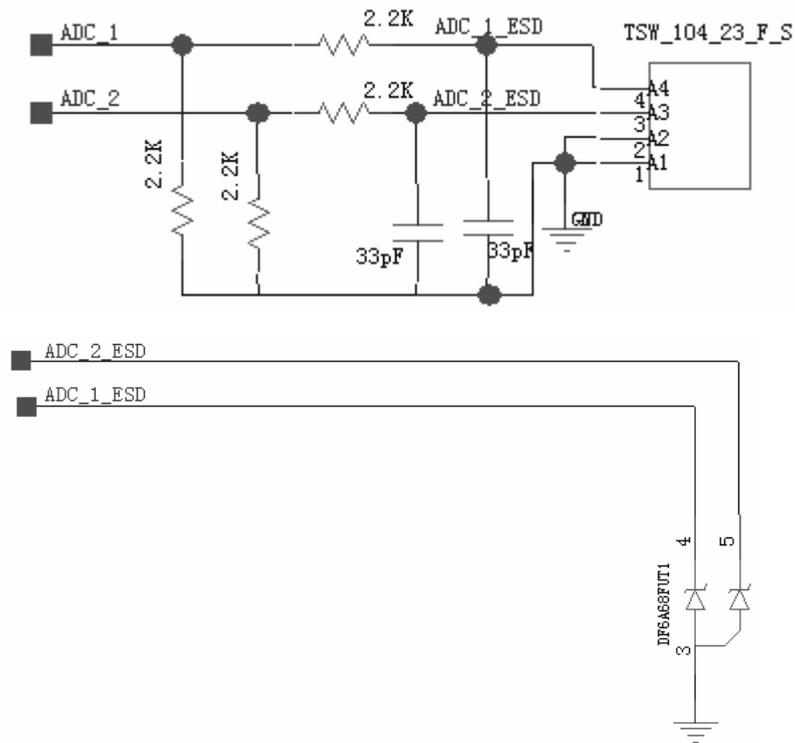
Table 4-4 Signals of the USB interface

Pin Number	Signal Name	Description
36	USB_D-	USB data line
38	USB_D+	USB data line

4.7 ADC Interfaces

The UM01-HW UMTS module supports two ADC interfaces for monitoring analog variables, such as the environmental temperature variable.

Figure 4-8 Reference circuits of the design of the ADC interfaces



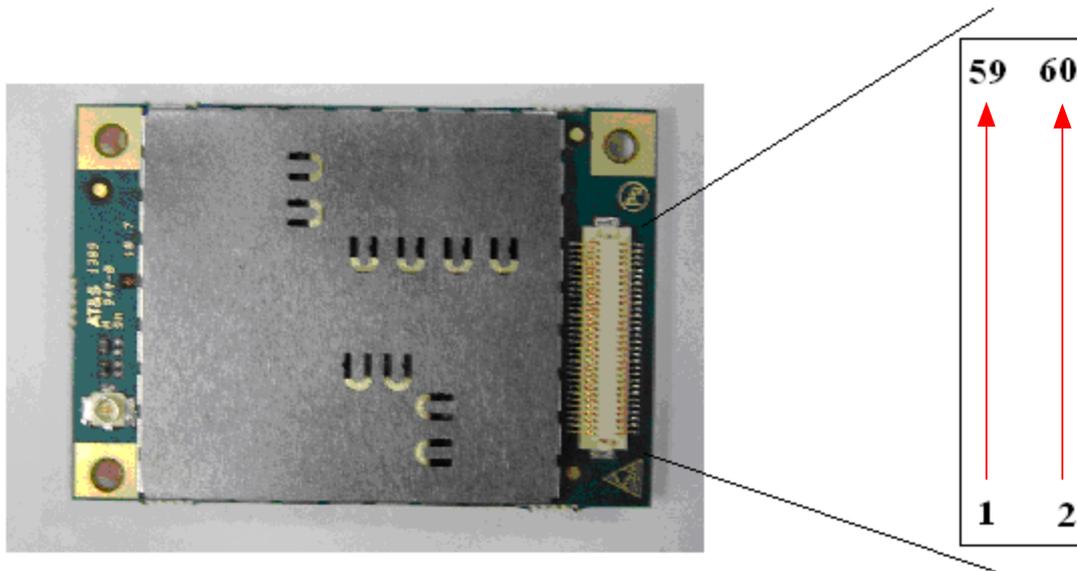
4.8 Status Indication Pins

The UM01-HW UMTS module has two LEDs. One LED indicates the network mode and the other LED indicates the signal status. The LEDs are controlled by the current sink. The high voltage is the voltage of VBAT (with the typical value of 3.8 V).

4.9 Pin Sequence

Figure 4-9 shows the sequence of the pins on the 60-pin B2B connector of the UM01-HW UMTS module.

Figure 4-9 Sequence of the pins on the UM01-HW UMTS module



5 Mechanics

5.1 Overview

This chapter describes the mechanical dimensions of the UM01-HW UMTS module, with the following dimensions included:

- Mechanical Dimensions of the UM01-HW UMTS Module
- Mechanical Dimensions of the B2B Connector

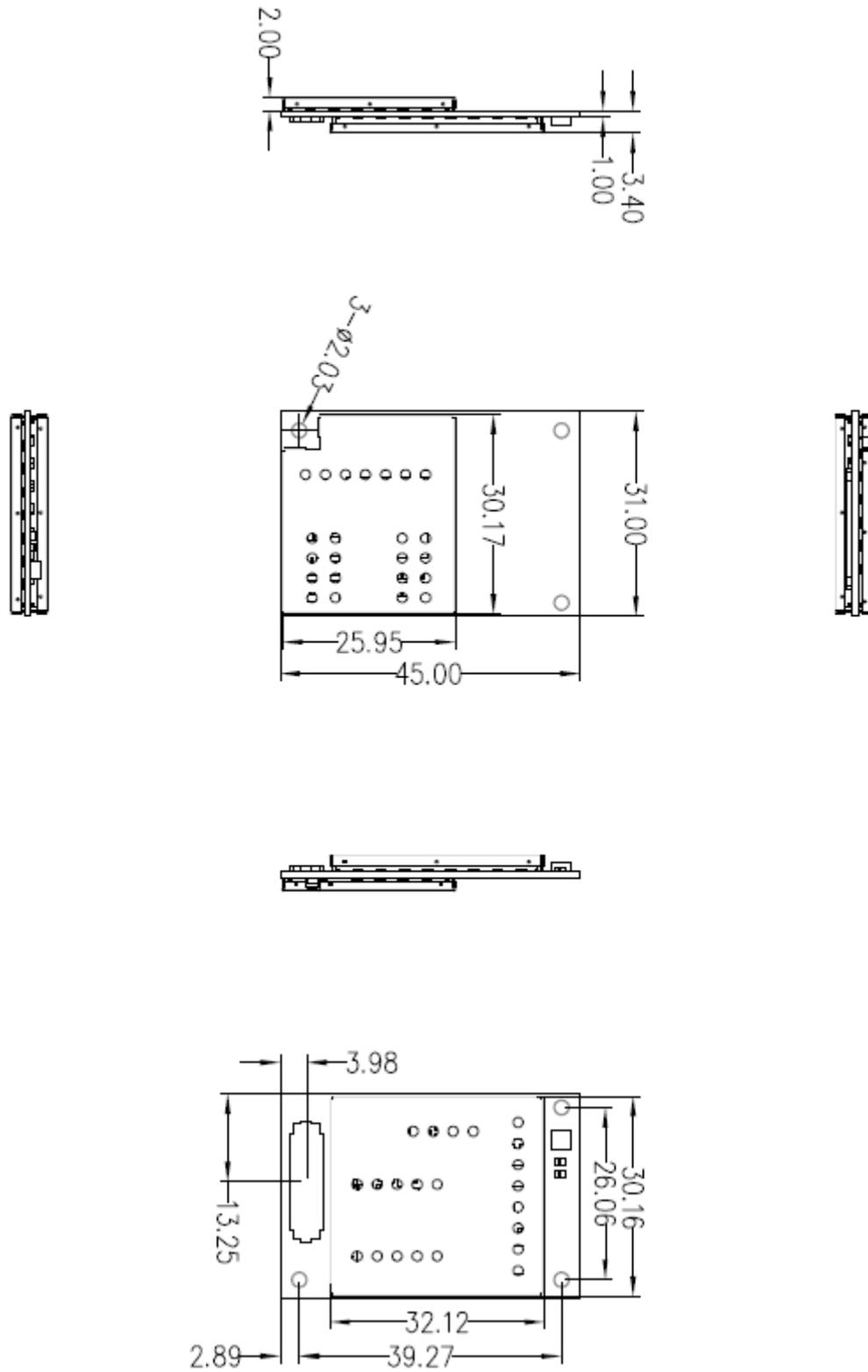
5.2 Mechanical Dimensions of the UM01-HW UMTS Module

Dimensions: 31 ± 0.20 mm x 45 ± 0.20 mm x 5.4 ± 0.20 mm

Weight: 9.8 (± 0.2) g

Figure 5-1 shows the mechanical dimensions of the UM01-HW UMTS module.

Figure 5-1 Mechanical dimensions of the UM01-HW UMTS module (unit: mm)



5.3 Mechanical Dimensions of the B2B Connector

The UM01-HW UMTS module adopts the DF12(3.0)-60DS-0.5V(86) 60-pin B2B connector supplied by HRS, with the pin pitch of 0.5 mm, the stacking height of 3 mm, and pluggable times of less than 50. The connector can be mated with the DF12(3.0)-60DP-0.5V(86), DF12(3.5)-60DP-0.5V(86), DF12(4.0)-60DP-0.5V(86), and DF12(5.0)-60DP-0.5V(86) supplied by HRS.

Figure 5-2 HRS DF12(3.0)-60DS-0.5V(86) connector on the UM01-HW UMTS module



Figure 5-3 HRS DF12(3.0)-60DP-0.5V(86) mating header on the user board

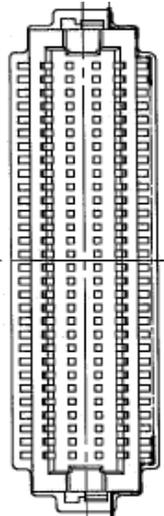
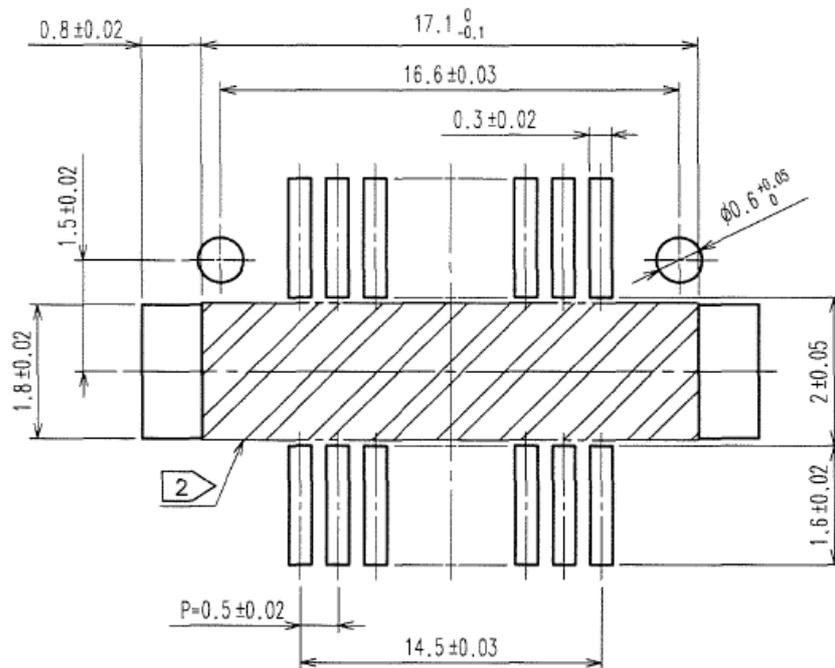


Table 5-1 DF12 series that are compatible with the UM01-HW UMTS module

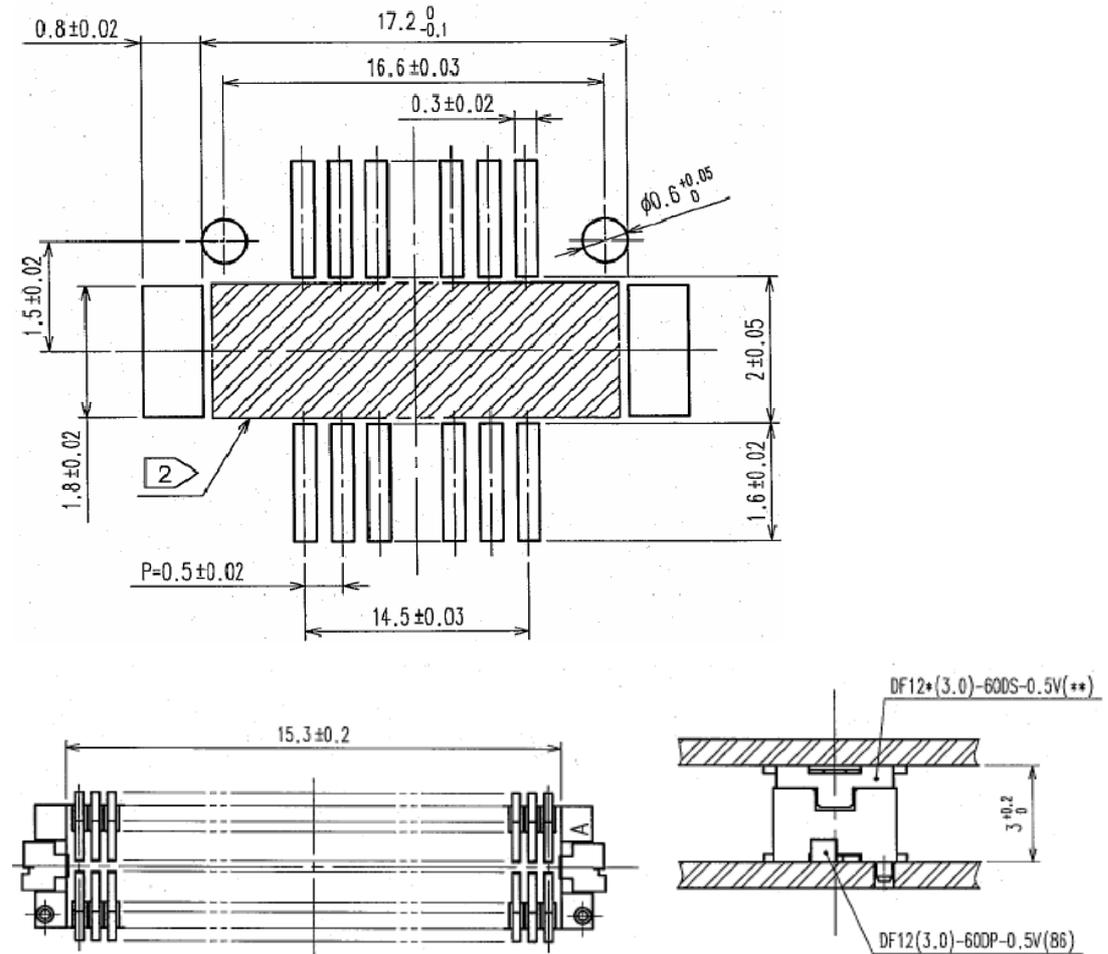
Product	Model	Stacking Height (mm)	HRS Number
Connector used on the UM01-HW UMTS module	DF12(3.0)-60DS-0.5V(86)	3.0	537-0611-1-86
Headers on the interface board	DF12(3.0)-60DP-0.5V(86)	3.0	537-0731-3-86

Figure 5-4 Dimensions of the connector on the UM01-HW UMTS module (unit: mm)



For more information about the connectors of Hirose, access <http://www.hirose-connectors.com>.

Figure 5-5 Dimensions of the connector pad on the user interface board of the UM01-HW UMTS module



A Acronyms and Abbreviations

AMR	Adaptive Multi-rate
BER	Bit Error Rate
BTS	Base Transceiver Station
B2B	Board-to-Board Connector
CSD	Circuit Switched Data
DSP	Digital Signal Processor
DCE	Data circuit-terminating equipment
DTE	Data terminal equipment
DTX	Discontinuous Transmission
EFR	Enhanced Full Rate
EGSM	Enhanced GSM
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
GMSK	Gaussian Minimum Shift Keying
GPRS	General Packet Radio Service
GSM	Global Standard for Mobile Communications
IMEI	International Mobile Equipment Identity
I/O	Input/Output
ISO	International Standards Organization
ITU	International Telecommunications Union
kbps	kbits per second
LED	Light Emitting Diode
MO	Mobile Originated

MT	Mobile Terminated
NTC	Negative Temperature Coefficient
PCS	Personal Cellular System
PCL	Power Control Level
PCS	Personal Communication System
PPP	Point-to-point protocol
QPSK	Quadrature Phase Shift Keying
RTC	Real Time Clock
UART	Universal asynchronous receiver-transmitter
UMTS	Universal Mobile Telecommunications System
VSWR	Voltage Standing Wave Ratio