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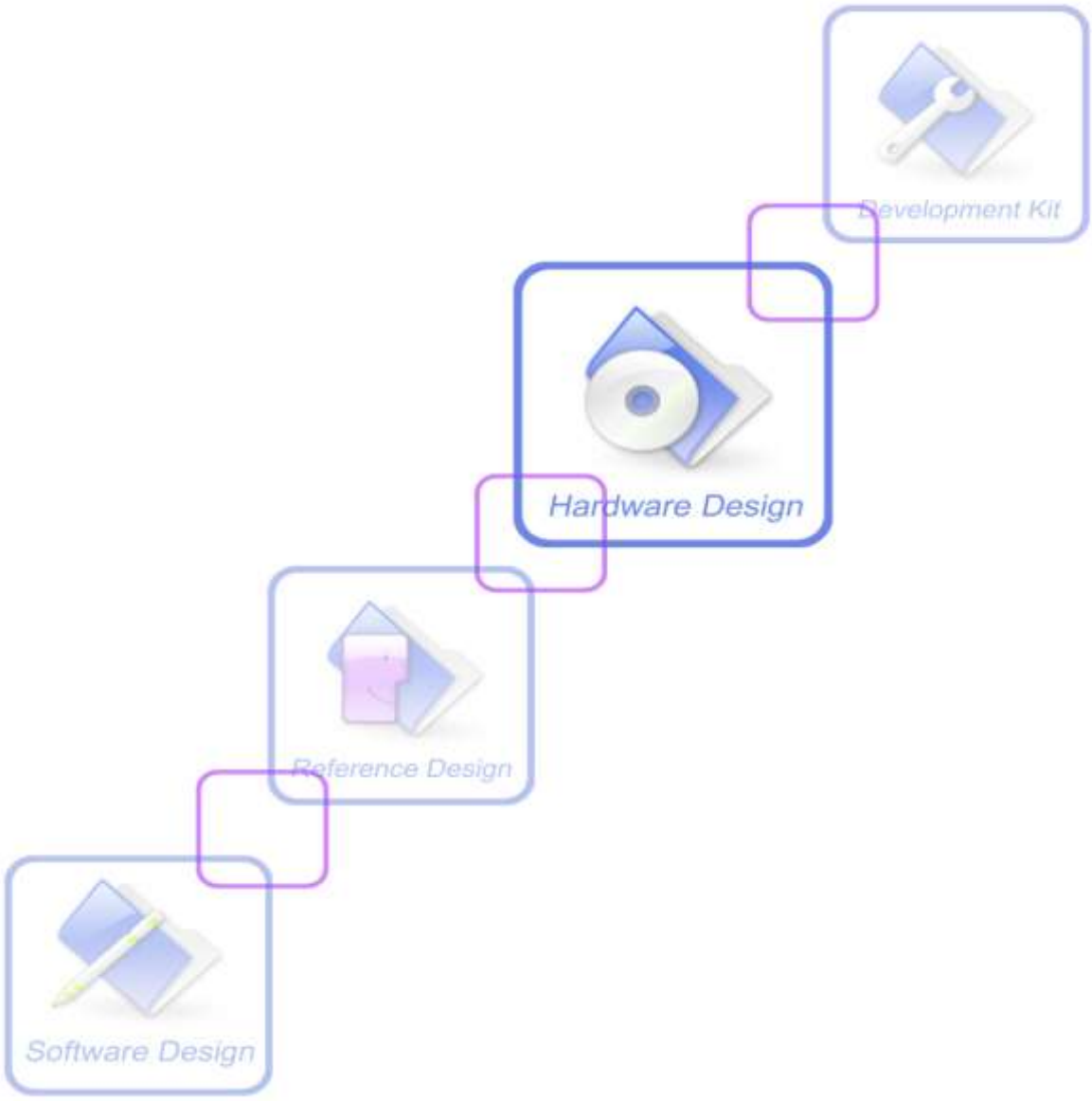
HDM1003G_User Guide

V1.03



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Version History

Date	Version	Description of change	Author
2012-05-3	1.00	Origin	Jianhua Liu
2012-08-15	1.01	§ 6.3 Correct the PIN assignment	Zhenrong Qu
2013-05-22	1.02	§ 6.3 Correct the signal assignment	Jianhua Liu
2014-11-01	1.03	1.Modify interface connector 2.Modify voltage input level	Jianhua Liu

1 Introduction

This document describes features, functions and interfaces of HDM1003G terminal in great detail. HDM1003G is a dual-band WCDMA modem that works on frequencies of WCDMA(850/1900MHz or 900/2100MHz). which is a ideal solution for wireless m2m applications.With the help of this document user can understand HDM1003G interface specifications, electrical and mechanical quickly.

Figure 1: HDM1003G overview

2 Key features

HDM1003G terminal has the following features:

1. Standard AT commands set
2. USB, RS232 or RS485 interface.
3. Watch-dog function
4. ESD protection
5. GPIOs
6. +5V~+30V Power supply

Table 1: HDM1003 key features

Feature	Implementation

Power supply	5V ~ 30V
Power saving	Typical power consumption in sleep mode is 70mW (BS-PA-MFRMS=9)
Frequency bands	● HDM1003G dual-band:WCDMA 850/1900MHz or 900/2100MHz. HDM1003G can search the frequency bands automatically. The frequency bands also can be set by AT command “AT+CBAND”. For details, please refer to *document [1]*. ● Compliant to GSM Phase 2/2+
Transmitting power	WCDMA 2100 @Power 23dBm Typical 460 mA @Power 21dBm Typical 410 mA @Power 10dBm Typical 245 mA WCDMA 1900 @Power 23dBm Typical 445 mA @Power 21dBm Typical 400 mA @Power 10dBm Typical 235 mA WCDMA 900 @Power 23dBm Typical 400 mA @Power 21dBm Typical 355 mA @Power 10dBm Typical 230 mA WCDMA 850 @Power 23dBm Typical 390 mA @Power 21dBm Typical 346 mA @Power 10dBm Typical 227 mA
Temperature range	● Normal operation: -30°C ~ +70°C ● Restricted operation: -40°C ~ -30°C and +80 °C ~ +85°C* ● Storage temperature -45°C ~ +90°C
Data GPRS	● WCDMA data downlink transfer: max. 14.4Mbps ● WCDMA data uplink transfer: max.5.76Mbps ● Integrate the TCP/IP protocol. ● Support Packet Broadcast Control Channel (PBCCH)
CSD	● Support CSD transmission
USSD	● Unstructured Supplementary Services Data (USSD) support
SMS	● MT, MO, CB, Text and PDU mode ● SMS storage: SIM card
FAX	Group 3 Class 1
SIM interface	Support SIM card: 1.8V, 3V
External antenna	SMA type RF connector

USB port	This interface is compliant with the USB2.0 specification. The USB2.0 specification requires hosts such as the computer to support all three USB speeds, namely low-speed (1.5Mbps), full-speed (12Mbps) and high-speed (480Mbps). USB charging and USB-OTG is not supported.
RS232 serial port	**Serial port:** ● Full modem interface with status and control lines, unbalanced, asynchronous. ● supports the baud rate:300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600, 3200000, 3686400, 4000000bps. Default rate is 115200bps.. ● Can be used for AT commands data stream. ● Support RTS/CTS hardware handshake and software ON/OFF flow control. ● Multiplex ability according to GSM 07.10 Multiplexer Protocol. ● Autobauding supports baud rate from 1200 bps to 57600bps.
Phonebook management	Support phonebook types: SM, FD, LD, RC, ON, MC.
SIM application toolkit	GSM 11.14 Release 99
Physical characteristics	Size: 116*59*23mm Weight: 110g
Firmware upgrade	Firmware upgradeable by USB interface

*HDM1003G does work at this temperature, but some radio frequency characteristics may deviate from the wcdma specification.

3 Terminal dimensions

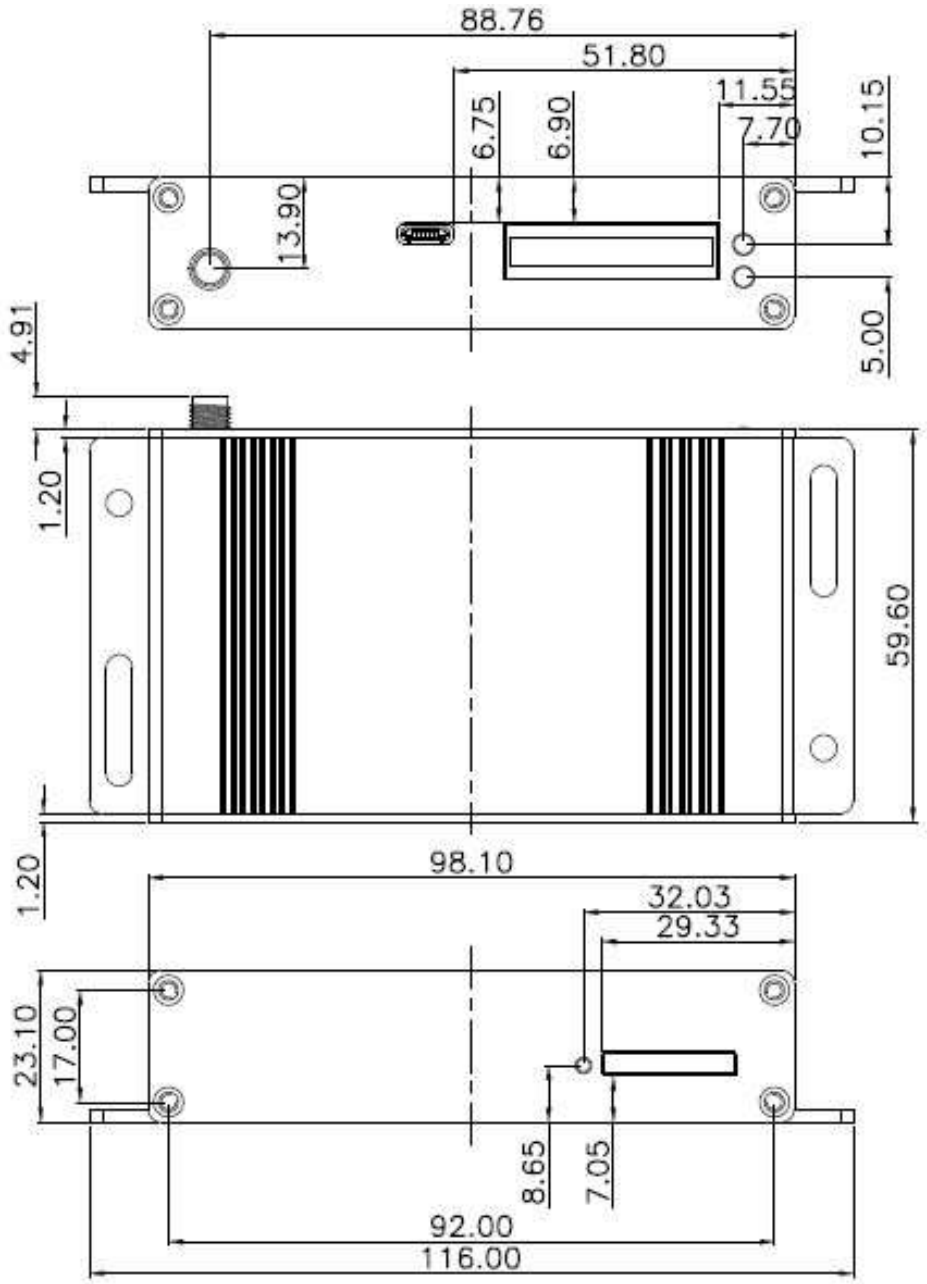


Figure 2: Mechanical dimensions of HDM1003G（Unit: mm）

4 Installation

The terminal can be fixed by four screw holes as follow figure.

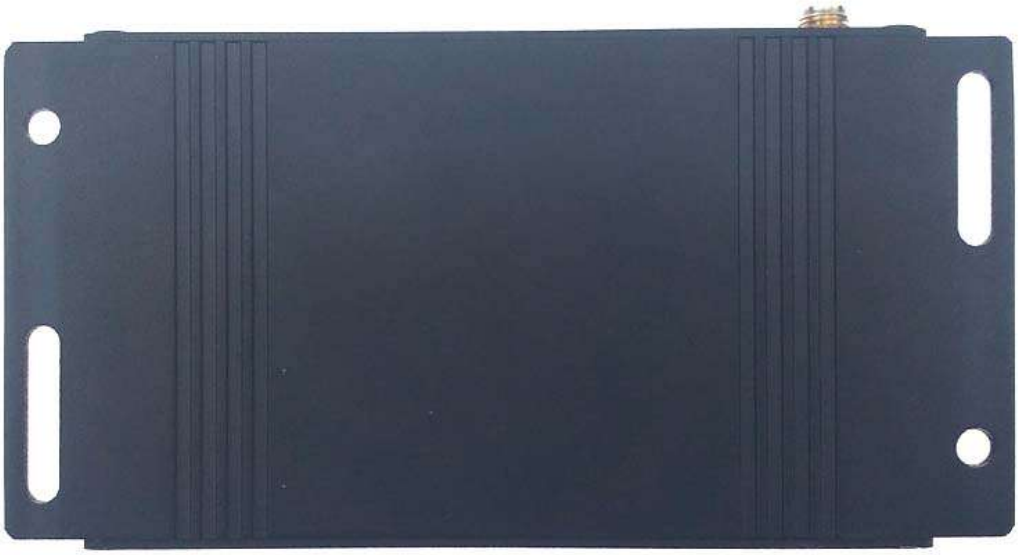


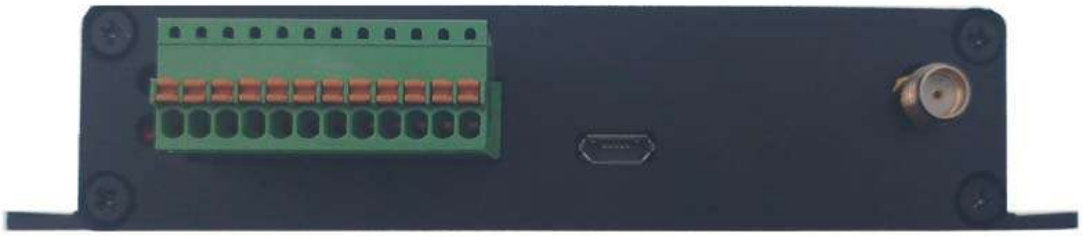
Figure 3: Installation of the terminal

5 Interface introduction

5.1 Overview

HDM1003G Terminal provides the following connectors for power supply, GPIOs,Serial port and antenna:

- The 3G antenna interface(SMA type female connector)
- The 2 PIN I/O port for power supply
- The 10 PIN I/O port for GPIOs and RS232
- LED indicator for power (Red) and GSM Netlight (Green)
- SIM card holder



Pins	Direction	Description
1	I	Power supply. +5V~+30V
2		GND
3	I/O	GPIO4
4	I/O	GPIO3
5	I/O	GPIO2
6	O	UART Ring
7	I	UART RTS
8	O	UART CTS
9	O	UART TXD or RS485 TXD
10	I	UART RXD or RX485 RXD
11	O	UART DCD
12	I	UART DTR

Figure 4: HDM1003G interface Front view

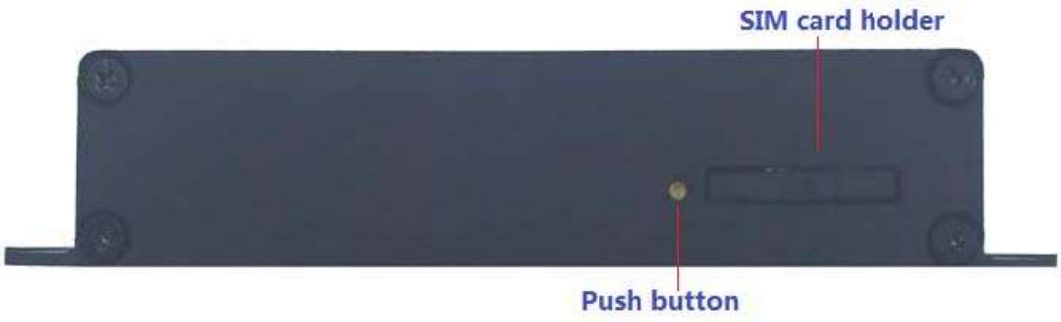


Figure 5: HDM1003G interface Back view

Note: For the I/O interface, Shenzhen Weblink Technology CO,. Ltd could provide 2-line cable and 10-line cable (optional) to assist developers; it will be introduced at the following chapter.

5.2 HDM1003G Functional Diagram

The following figure shows a functional diagram of HDM1003G and typical accessories.

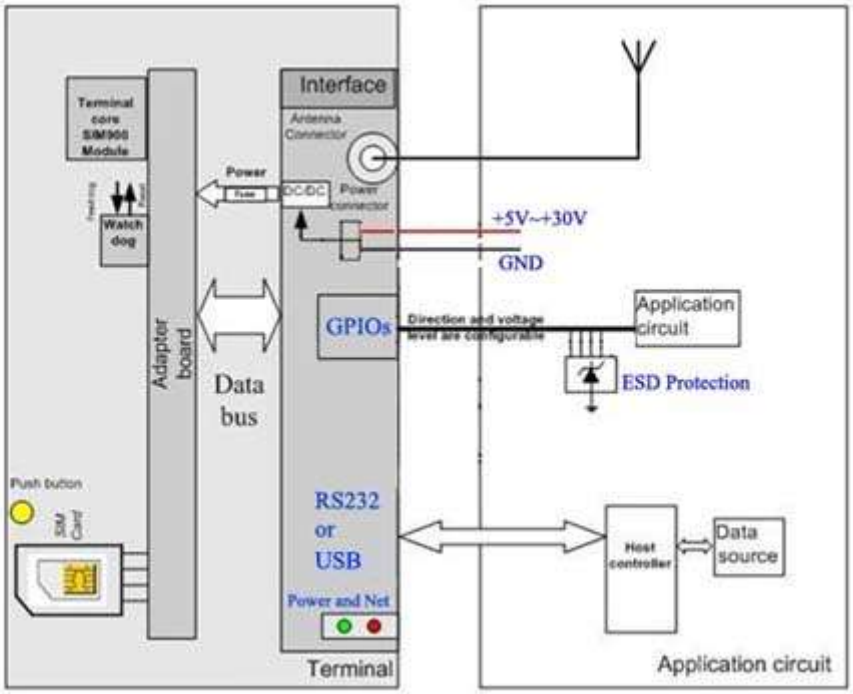


Figure 6: HDM1003G functional diagram

5.3 Accessory information

Figure 7: Accessory information

A: HDM1003G Terminal
B: GSM Antenna

6 Application Interface

6.1 Power Supply

Customer can use the DC adapter that Shenzhen Weblink Technology CO,. Ltd provides as the power source.
If customer does not use the adapter, then DC source should be satisfied with the following requirements.

- Input voltage range +5V~+30V
- Normal voltage 12V
- Current ability 1A

Table 2: The consumption in sleep mode

HDM1003G	@5V	@12V	@15V
Sleep current	14.5mA	7.75mA	5.02mA

The following chapter introduces the power line that Shenzhen Weblink Technology CO,. Ltd provides to customers, customer can power the terminal by connect the terminal to the DC source via this line.

The power line includes four lines as the following figure shows, and table 3 gives a detailed description.

Table 3: The power line assignment

PIN Number	Colour	Item
1	Red	+5~+30V
2	Black	GND

Figure 8: dimensions of power line（Unit: mm）

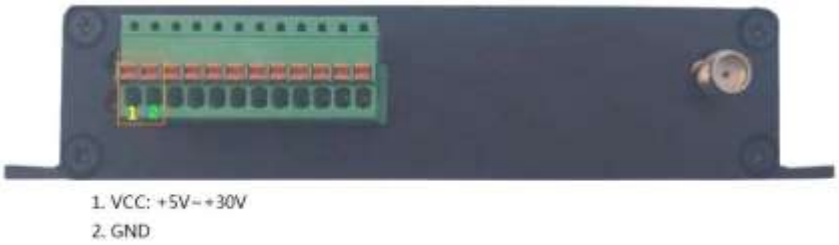


Figure 9: Power interface

When a valid power appears the terminal will power up automatic, for the MCU that inside the terminal processed the power up part, MCU also acts as a Watch Dog, when the terminal runs wrong, MCU will cut off the power and recover it immediately to restart the terminal.

6.2 Serial Interface

HDM1003G provides one asynchronous RS232 serial port.The RS232 standard interface serves to connect a PC, Data Terminal Equipment (DTE) or other application, which acts as host controller of the HDM1003G Terminal with all its functions. Through the USB or RS232 interface it can be used as WCDMA modem for sending and receiving of SMS, Data and Fax calls.

Figure 10: Pin assignment RS-232

Table 4: RS-232 Connector

Pin no	Signal name	I/O	Function
6	RING	O	Ring indicator
7	RTS	I	Request To Send
8	CTS	O	Clear to send
9	TXD	O	Transmit Data (RS485 TXD)
10	RXD	I	Receive Data (RS485 RXD)
11	DCD	O	Data Carrier Detected
12	DTR	I	Data Terminal Ready

Note: HDM1003G supports autobauding, Autobauding allows HDM1003G to automatically

detect the baud rate of the host device. User can use AT command "AT+IPR=x" to set a fixed baud rate and the setting will be saved to non-volatile flash memory automatically. After the configuration is set as fixed baud rate, the URC such as "RDY", "+CFUN: 1" and "+CPIN: READY" will be reported when HDM1003G is powered on.

Hyper terminal usually as the PC software tool to operate HDM1003G; customer can set up a connection between PC and terminal, configure the port properties as the figure 9 shows.

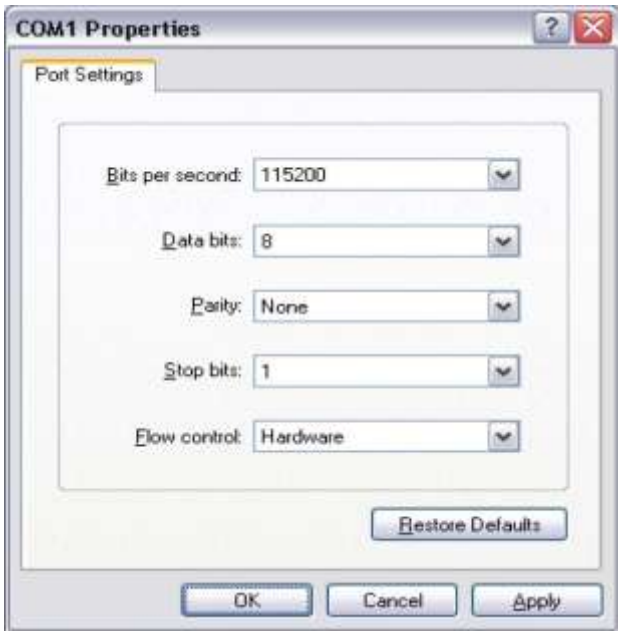


Figure 11: COM port properties of the hyper terminal

6.3 10 PIN I/O interface

HDM1003G provides a 10 PIN I/O interface for customer use, including GPIOs and RS232 channel.

The following figure gives a brief view of signal assignment.

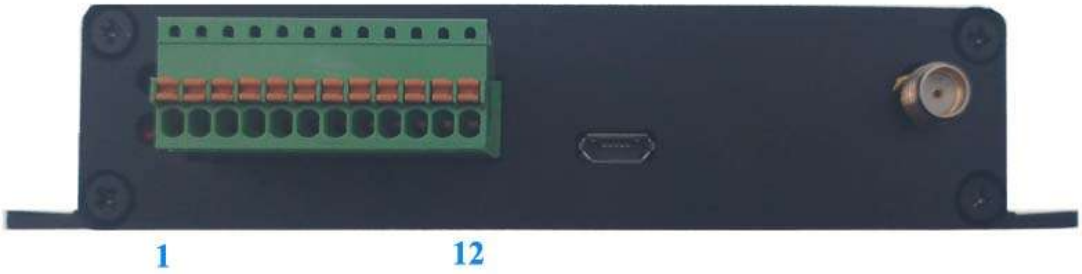


Figure 12: signal assignment of 10PIN I/O port

To make the usage conveniently, Shenzhen Weblink Technology CO,. Ltd provides a cable

for customer, it can be inserted to the 10 PIN I/O port so customer can develop their application by connecting some devices.

Figure 13 shows the specification of the cable.

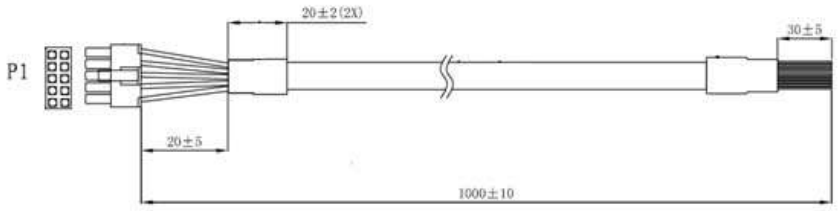


Figure 13: Dimensions of 10-line cable

P1	Terminal signal		
	Signal name	I/O	Comments
3	GPIO4	I/O	Configurable by AT commands
4	GPIO3	I/O	
5	GPIO2	I/O	
6	RING	O	RING Indicator
7	RTS	I	Request to send
8	CTS	O	Clear to send
9	TXD	O	Transmit Data (RS485 TXD)
10	RXD	I	Recieve Data (RS485 TXD)
11	DCD	O	Data Carrier Detected
12	DTR	I	Data Terminal Ready

6.3.1 GPIO interfaces

HDM1003G provides 4 GPIO pins. The output voltage level of the GPIO can be set by the AT command "AT+ SGPIO". The input voltage level of the GPIO can also be read by the AT command "AT+ SGPIO". The following table shows the detail commands about GPIO.

Table 5: AT+SGPIO Control the GPIO

AT+ SGPIO Control the GPIO	
Test Command	Response

AT+SGPIO=?	**+SGPIO: (0-1),(1-12),(0-2),(0-1)** **OK**
	Parameters See Write Command
Write Command **AT+SGPIO=** **<operation>,<GPIO>,<function>,<level>**	Response **OK** **ERROR**
	Parameters **<Operation>** 0 Set the GPIO function including the GPIO output and GPIO as the Keypad. 1 Read the GPIO level. Please note that only when the gpio is set as input, user can use parameter 1 to read the GPIO level, otherwise the module will return "ERROR". **<GPIO>** The GPIO you want to be set. (It has relations with the hardware, please refer to the hardware manual) **<function>** Only when <Operation> is set to 0, this option takes effect. 0 Set the GPIO to input. 1 Set the GPIO to output 2 Set the GPIO to keypad **<level>** 0 Set the GPIO low level 1 Set the GPIO high level

6.4 Antenna interface

6.4.1 Antenna connector

Antenna connector allows transmission of radio frequency (RF) signals between the modem and the external supplied antenna. The HDM1003G modem is fitted with a 50Ω male SMA connector.

Figure 14: Antenna interface

6.4.2 Antenna specifications

The antenna is a very important component in the system. Since the antenna transmits and receives electromagnetic signal, and its efficiency depends on the antenna's type, placement and the environment of the antenna operating.

The recommended antenna specifications are showed in Table 12:

Table 6: antenna specifications

Frequency range	WCDMA 850/1900 or 900/2100MHz
Impedance	50 ohm
Input power	> 33dBm (2W) peak power in WCDMA
VSWR recommended	≤2:1
VSWR absolute max	≤10:1
Gain	≤3dBi

6.4.3 Antenna placement

The antenna performance is very easily influenced by other electronic devices. So the antenna placement should be considered carefully as follow.

1. Place away from other electronic devices or other antennas.
2. Place far away from metal material.
3. Face the base station antenna directly if the signal strength is very weak.

6.5 LED indicator

A red led indicates the power status, when a valid power appears, the red led will lighten up. But a lighten up red led does not mean that the terminal has been powered up.

A green led indicates the terminal status and WCDMA net status, after the terminal been powered up and registered to the network, it will blink at a certain frequency.

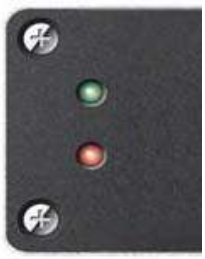


Figure 15: Indicator LED

Table 7: Status of the NETLIGHT indicator (Green)

Status	HDM1003G behavior
Off	HDM1003G is not running
64ms On/ 800ms Off	HDM1003G not registered the network
64ms On/ 3000ms Off	HDM1003G registered to the network
64ms On/ 300ms Off	WCDMA communication is established

6.6 SIM Card Interface

The SIM interface complies with the GSM Phase 1 specification and the new GSM Phase 2+ specification for FAST 64 kbps SIM card. Both 1.8V and 3.0V SIM card are supported. The SIM interface is powered from an internal regulator inside the terminal.

HDM1003G supports SIM card "hot" plug, which means that the terminal can sense the SIM card inserted in or drawn out when the module is on

AT command "AT+CSDT" is used to enable or disable SIM card detection function. For details of this AT command, please refer to the following table.

Table 8: AT+CSDT Switch On or Off Detecting SIM Card

AT+CSDT Switch On or Off Detecting SIM Card	
Test Command **AT+CSDT =?**	Response **+CSDT: (0-1)** **OK**
	Parameter

	See Write Command
Read Command **AT+CSDT?**	Response **+CSDT: <mode>** **OK**
	Parameter See Write Command
Write Command **AT+CSDT=<mode>**	Response **OK** **ERROR**
	Parameter **<mode>** 0 Switch off detecting SIM card 1 Switch on detecting SIM card

Note: when the detecting function is activated, the status of sim card will auto report via the serial port. The sensing of a hot removal of the SIM is not supported during power saving mode (AT+CFUN=4).

Figure 16: Installation of SIM Card

7 Electrical, Reliability and Radio Characteristics

7.1 Absolute Maximum Ratings

The absolute maximum ratings stated in following table are stress ratings under non-operating conditions. Stresses beyond any of these limits will cause permanent damage to HDM1003G.

Table 9: Absolute maximum ratings

Symbol	Parameter	Min	Typ	Max	Unit
VBAT	Power supply voltage	4.5	-	42	V
V_I^*	Input voltage	-0.3	-	3.1	V
I_I^*	Input current	-	-	10	mA
I_O^*	Output current	-	-	10	mA

*These parameters are for digital interface pins, such as GPIO, UART and DEBUG.

7.2 Recommended Operating Conditions

Table 10: Recommended operating conditions

Symbol	Parameter	Min	Typ	Max	Unit
VBAT	Power supply voltage	5	12	30	V
T_{OPER}	Operating temperature	-40	+25	+85	℃
T_{STG}	Storage temperature	-45		+90	℃

7.3 Electro-Static Discharge

HDM1003G is an ESD sensitive component, so more attention should be paid to the procedure of handling and packaging. The ESD test results are shown in the following table.

Table 11: The ESD characteristics (Temperature: 25℃, Humidity: 45 %)

Test item	Contact discharge	Air discharge
Shell	±10KV	±15KV

RF interface	±10KV	±15KV
RS232 interface	±10KV	±15KV
Audio interface	±10KV	±15KV
SIM card holder	±10KV	±15KV

7.4 Operating frequency

The operating frequencies in WCDMA 850/1900MHz or 900/2100MHz are conform to the WCDMA Specifications, shown as bellow.

Table 12: Operating frequency

Mode	Freq. TX(MHz)	Freq. RX(MHz)
GSM-850	824 – 849	869 – 894
E-GSM-900	890-915	935-960
	880-890	925 - 935
DCS-1800	1710-1785	1805-1880
PCS-1900	1850 - 1910	1930 - 1990
WCDMA 2100	2110～2170	2110～2170
WCDMA 1900	1930～1990	1850～1910
WCDMA 900	925 ～960	880 ～915
WCDMA 850	869 ～894	824 ～849

7.5 Transmitter output power and receiver sensitivity

The HDM1003G's conducted transmitter output power and receiver sensitivity are shown as bellow:

Table 13: Transmitter output power and receiver sensitivity

Frequency	Max	Min
GSM850	33dBm ±2dB	5dBm ±5dB
E-GSM900	33dBm ±2dB	5dBm ±5dB
DCS1800	30dBm ±2dB	0dBm ±5dB
PCS1900	30dBm ±2dB	0dBm ±5dB
GSM850 (8-PSK)	27dBm ±3dB	5dBm ±5dB
E-GSM900 (8-PSK)	27dBm ±3dB	5dBm ±5dB
DCS1800 (8-PSK)	26dBm +3/-4dB	0dBm ±5dB

PCS1900(8-PSK)	26dBm +3/-4dB	0dBm ±5dB
WCDMA 2100	24dBm +1/-3dB	-56dBm ±5dB
WCDMA 1900	24dBm +1/-3dB	-56dBm ±5dB
WCDMA 850	24dBm +1/-3dB	-56dBm ±5dB
WCDMA 900	24dBm + 1/-3dB	-56dBm ±5dB

Appendix

A. Related Documents

Table 14: Related documents

SN	Document name	Remark
[1]	SIM5360_AT Command Manual	SIM5360 AT Command Manual
[2]	AN_SIM5360_TCPIP	TCP/IP Applications User Manual
[3]	SIM5360_Multiplexer User Manual_Application Note	SIM5360 Multiplexer User Manual Application Note
[5]	SIM5360_Embedded AT Application Note	SIM5360 Embedded AT Application Note
[6]	AN_Serial Port	Application Note About Serial Port
[7]	HDM1003G GPRS Setup User Guide	HDM1003G GPRS Setup User Guide
[8]	ITU-T Draft new recommendation V.25ter:	Serial asynchronous automatic dialing and control
[9]	GSM 07.07:	Digital cellular telecommunications (Phase 2+); AT command set for GSM Mobile Equipment (ME)
[10]	GSM 07.10:	Support GSM 07.10 multiplexing protocol
[11]	GSM 07.05:	Digital cellular telecommunications (Phase 2+); Use of Data Terminal Equipment – Data Circuit terminating Equipment (DTE – DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)
[12]	GSM 11.14:	Digital cellular telecommunications system (Phase 2+); Specification of the SIM Application Toolkit for the Subscriber Identity Module – Mobile Equipment (SIM – ME) interface
[13]	GSM 11.11:	Digital cellular telecommunications system (Phase 2+); Specification of the Subscriber Identity Module – Mobile Equipment (SIM – ME) interface

[14]	GSM 03.38:	Digital cellular telecommunications system (Phase 2+); Alphabets and language-specific information
[15]	GSM 11.10	Digital cellular telecommunications system (Phase 2)； Mobile Station (MS) conformance specification； Part 1: Conformance specification

B. Terms and Abbreviations

Table 15: Terms and Abbreviations

Abbreviation	Description
ADC	Analog-to-Digital Converter
AMR	Adaptive Multi-Rate
AT	Attention commands
CS	Coding Scheme
CSD	Circuit Switched Data
CTS	Clear to Send
DTE	Data Terminal Equipment (typically computer, terminal, printer)
DTR	Data Terminal Ready
DTU	Data Transmit Unit
DTX	Discontinuous Transmission
EFR	Enhanced Full Rate
EGSM	Enhanced GSM
ESD	Electrostatic Discharge
ETS	European Telecommunication Standard
FR	Full Rate
GPRS	General Packet Radio Service
GSM	Global Standard for Mobile Communications
HR	Half Rate
IMEI	International Mobile Equipment Identity
Li-ion	Lithium-Ion
MO	Mobile Originated
MS	Mobile Station (GSM engine), also referred to as TE
MT	Mobile Terminated
NC	NO Connect
NA	Not Access
PAP	Password Authentication Protocol
PBCCH	Packet Broadcast Control Channel

PCB	Printed Circuit Board
PCL	Power Control Level
PCS	Personal Communication System, also referred to as GSM 1900
PDU	Protocol Data Unit
PPP	Point-to-point protocol
RF	Radio Frequency
RMS	Root Mean Square (value)
RTC	Real Time Clock
RX	Receive Direction
SIM	Subscriber Identification Module
SMS	Short Message Service
TE	Terminal Equipment, also referred to as DTE
TX	Transmit Direction
UART	Universal Asynchronous Receiver & Transmitter
URC	Unsolicited Result Code
USSD	Unstructured Supplementary Service Data
Phonebook abbreviations	
FD	SIM fix dialing phonebook
LD	SIM last dialing phonebook (list of numbers most recently dialed)
MC	Mobile Equipment list of unanswered MT calls (missed calls)
ON	SIM (or ME) own numbers (MSISDNs) list
RC	Mobile Equipment list of received calls
SM	SIM phonebook
NC	Not connect

C. Safety Caution

Table 16: Safety caution

Marks	Requirements
	When in a hospital or other health care facility, observe the restrictions about the use of mobiles. Switch the cellular terminal or mobile off, medical equipment may be sensitive to not operate normally for RF energy interference.
	Switch off the cellular terminal or mobile before boarding an aircraft. Make sure it is switched off. The operation of wireless appliances in an aircraft is forbidden to prevent interference with communication systems. Forget to think much of these instructions may lead to the flight safety or offend against local legal action, or both.

	Do not operate the cellular terminal or mobile in the presence of flammable gases or fumes. Switch off the cellular terminal when you are near petrol stations, fuel depots, chemical plants or where blasting operations are in progress. Operation of any electrical equipment in potentially explosive atmospheres can constitute a safety hazard.
	Your cellular terminal or mobile receives and transmits radio frequency energy while switched on. RF interference can occur if it is used close to TV sets, radios, computers or other electric equipment.
	Road safety comes first! Do not use a hand-held cellular terminal or mobile when driving a vehicle, unless it is securely mounted in a holder for hands free operation. Before making a call with a hand-held terminal or mobile, park the vehicle.
	WCDMA cellular terminals or mobiles operate over radio frequency signals and cellular networks and cannot be guaranteed to connect in all conditions, for example no mobile fee or a invalid SIM card. While you are in this condition and need emergent help, please remember using emergency calls. In order to make or receive calls, the cellular terminal or mobile must be switched on and in a service area with adequate cellular signal strength. Some networks do not allow for emergency call if certain network services or phone features are in use (e.g. lock functions, fixed dialing etc.). You may have to deactivate those features before you can make an emergency call. Also, some networks require that a valid SIM card be properly inserted in the cellular terminal or mobile.

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