CLM920 LTE Module

Hardware specification

Version 1.0

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Revision History

Version	Change Summary	Date	Author
V1.0	Initial Version	2013/11/26	

Contents

1 Abstract

1.1 Summary

This document introduces the functions, interfaces, technical specifications, appearance and structure and other related content of CLM920 modules. It can provide reference for the design engineers who uses this module.

1.2 Abbreviations

ADC	Analog-Digital Converter
AFC	Automatic Frequency Control
AGC	Automatic Gain Control
ARFCN	Absolute Radio Frequency Channel Number
B2B	Board to Board Connector
BER	Bit Error Rate
CDMA	Code Division Multiple Access
DAI	Digital Audio interface
DAC	Digital-to-Analog Converter
DSP	Digital Signal Processor
DTR	Data Terminal Ready
EFR	Enhanced Full Rate
EMC	Electromagnetic Compatibility
EMI	Electro Magnetic Interference
ESD	Electronic Static Discharge
EVDO	Evolution Data Only
FR	Full Rate
GPRS	General Packet Radio Service
HR	Half Rate
IMEI	International Mobile Equipment Identity
ISO	International Standards Organization
PLL	Phase Locked Loop
PPP	Point-to-point protocol
RAM	Random Access Memory
ROM	Read-only Memory
RTC	Real Time Clock
SMS	Short Message Service
UART	Universal asynchronous

	receiver-transmitter
UIM	User Identifier Management
USB	Universal Serial Bus
VSWR	Voltage Standing Wave Ratio

2 INTRODUCTION

2.1 Overview

CLM920 series module is 4G module with the standard interface of PCI Express Mini Card 1.2 which based on Qualcomm MDM9215 chipset platform. Supporting the WIN7/WIN8/Android 4.0 embedded operation systems. CLM920 can be used in the following applications:

- ✧ Netbook, Laptop
- ✧ PDA、MID
- ✧ Wireless POS
- ✧ Wireless Advertisement, Media
- ✧ Remote Surveillance
- ✧ Smart Metering
- ✧ Lottery Machine
- ✧ Other Wireless Terminals

2.2 PRODUCT DEFINITION

Features	Description
Physical Features	Length * width * height
Frequency Band	● LTE（FDD）B1/B3/B7/B8/B20 ● UMTS/HSDPA/HSUPA TRI Band B1/B3/B8 ● GSM/GPRS/EDGE Quad Band 850/900/1800/1900MHz
Temperature	Normal Operating Temperature –10 ℃ to +55 ℃ Limit Operating Temperature –20 ℃ to +70 ℃
Storage Temperature	–40 ℃ to +85 ℃
Voltage	Type 3.3 V
Application Interface	USIM(3.0V or 1.8V)
	USB2.0(High-Speed)
	RESET# pin
	WAKEUP_AP# pin
	WAKEUP_BP# pin
	W_DISABLE# pin
	POWER On/Off# pin
	POWER SUPPLY# pin
Antenna connector	Main antenna and diversity antenna，Murata MM4829-2702RA4

Data Services	GPRS: DL 85.6 kbps/UL 85.6 kbps
	EDGE: DL 236.8 kbps/UL 236.8 kbps
	WCDMA CS: DL 64 kbps/UL 64 kbps
	WCDMA PS: DL 384 kbps/UL 384 kbps
	HSPA+: DL 21.6 Mbps/UL 5.76 Mbps
	DC-HSPA+: DL 42 Mbps/UL 5.76 Mbps
	LTE FDD: DL 100 Mbps/UL 50 Mbps @20M BW cat3

2.3 KEY FEATURES

2.3.1 FEATURES INTRODUCTION

CLM920 module mainly contains following Circuit:

- Base Band Processing Unit
- Power Management Unit
- Memory Unit
- RF Transceiver Unit
- RF Front-end Unit

2.3.2 FEATURES BLOCK DIAGRAM

CLM920 Module：

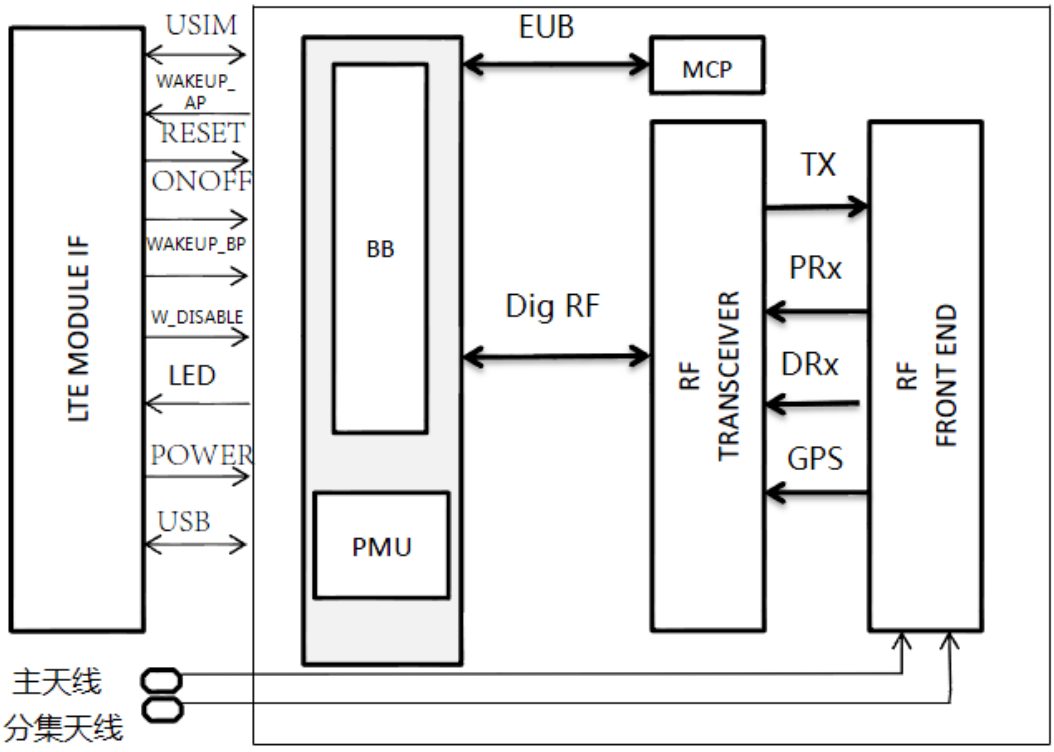

图 1-1 CLM920 FEATURES BLOCK DIAGRAM

3. INTERFACE APPLICATION DESCRIPTION

3.1 Outline

- Interface Definition
- Power Interface
- USB Interface
- USIM Interface
- Wake-up Interface
- WWAN Control Interface
- RF Antenna Interface

3.2 Module Interface Definition

Table 1-1

Pin Number	Signal Name	Input / Output	Function	Mark
1	WAKEUP_AP	Output	Module wake up master	
2	3.3V	Power Input	Power Input	
3	UART_RXD	Input	UART Port Receiving	
4	GND		Ground signal	
5	UART_TXD	Output	UART Port Sending	
6	NC		NC	
7	NC		NC	
8	VREG_USIM	Output	2.8V/1.8V Power	
9	GND		Ground signal	
10	UIM1_DATA	Bilateral	USIM Data Cable	
11	NC		NC	
12	UIM1_CLK	Output	USIM Clock Line	
13	NC		NC	
14	UIM1_RESET	Output	USIM Reset signal	
15	GND		Ground signal	
16	NC		NC	
17	NC		NC	
18	GND		Ground signal	
19	WAKEUP_BP	Input	Master wakeup module	
20	W_DISABLE	Input	WWAN Disable	
21	GND		Ground signal	
22	RESET	Input	Reset signal	

23	NC		NC	
24	3.3V	Power Input	Power Input	
25	NC		NC	
26	GND		Ground signal	
27	GND		Ground signal	
28	NC		NC	
29	GND		Ground signal	
30	NC		NC	
31	NC		NC	
32	NC		NC	
33	NC		NC	
34	GND		Ground signal	
35	GND		Ground signal	
36	USB_DM	Bilateral	USB Negative data	
37	GND		Ground signal	
38	USB_DP	Bilateral	USB Positive data	
39	3.3V	Power Input	Power Input	
40	GND		Ground signal	
41	3.3V	Power Input	Power Input	
42	NC		NC	
43	GND		Ground signal	
44	NC		NC	
45	PCM_CLK	Input	Clock pulse	
46	NC		NC	
47	PCM_DOUT	Output	Data Sending	
48	NC		NC	
49	PCM_DIN	Input	Data Receiving	
50	GND		Ground signal	
51	PCM_SYNC	Input	Frame synchronization signal	
52	3.3V	Power Input	Power Input	

3.3 Power Interface Definition

CLM920 Module's power interface has two parts:

- 3.3V is module's working power
- VREG_USIM supply USIM Card working power;

CLM920 Module's Power Interface definition:

PIN Number	Signal name	Input / Output	Description	DC Characteristics（V）		
				Min	Typical	Max
2，24，39，41，52	Power	Input	Module Power Supply	3.2V	3.8V	4.2V
8	USIM Power	Output	USIM Power Supply	-0.3	1.8V/2.85V	1.98/3.3V
4，9，15，18，21，26，27，29，34，35，37，40，43，50	Ground signal		Ground signal	-	0	-

3.4 USB Interface Definition

3.4．1 Outline

CLM920 Module's USB Port support USB2.0 High-speed protocol，USB input and output need to comply with USB2.0 characteristics. USB definition is as below：

PIN Number	Signal Name	I/O Property	Description
36	USB_D-	Bilateral	USB Data-
38	USB_D+	Bilateral	USB Data+
4，9，15，18，21，26，27，29，34，35，37，40，43，50	GND		Ground

3.4．2 USB Circuit Design Reference ：

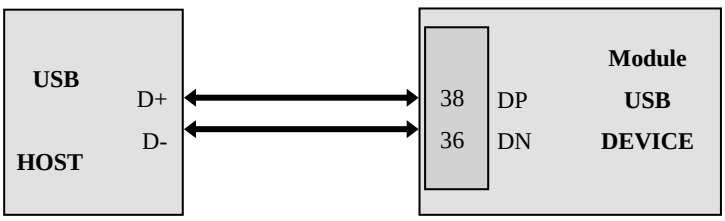

Table 3-2

Note：
1、ESD protection devices should be added to USB data cable. The USB design on DTE interface board must be strictly complied with USB2.0 protocol, Differential line，impedance is 90Ω.
2、USB bus-powered voltage is supplied by module itself. At the same time ，because of the module's USB interface don't provide power for external devices，so module can only to be used as USB bus slave device.

USB port support following function:
a) Software Download and upgrade
b) Data communication
c) AT Command

3.5 USIM interface definition

3.5．1 Outline

CLM920 Module provides a USIM card slot that complied with ISO 7816-3 standard and support 1.8V/3.0V USIM Card.
USIM interface definition：

PIN Number	Signal name	I/O Property	High level value	Description
8	VREG_USIM	Output	1.8V/2.85V	USIM Power
10	UIM1_DATA	Bilateral	1.8V/2.85V	USIM Data
12	UIM1_CLK	Output	1.8V/2.85V	USIM Clock
14	UIM1_RESET	Output	1.8V/2.85V	USIM Reset
4，9，15，18，21，26，27，29，34，35，40，50	GND		0V	Ground signal

3.5．2 USIM Card Design Reference

CLM920 module is without USIM card slot ，it needs to be added on user's devices.

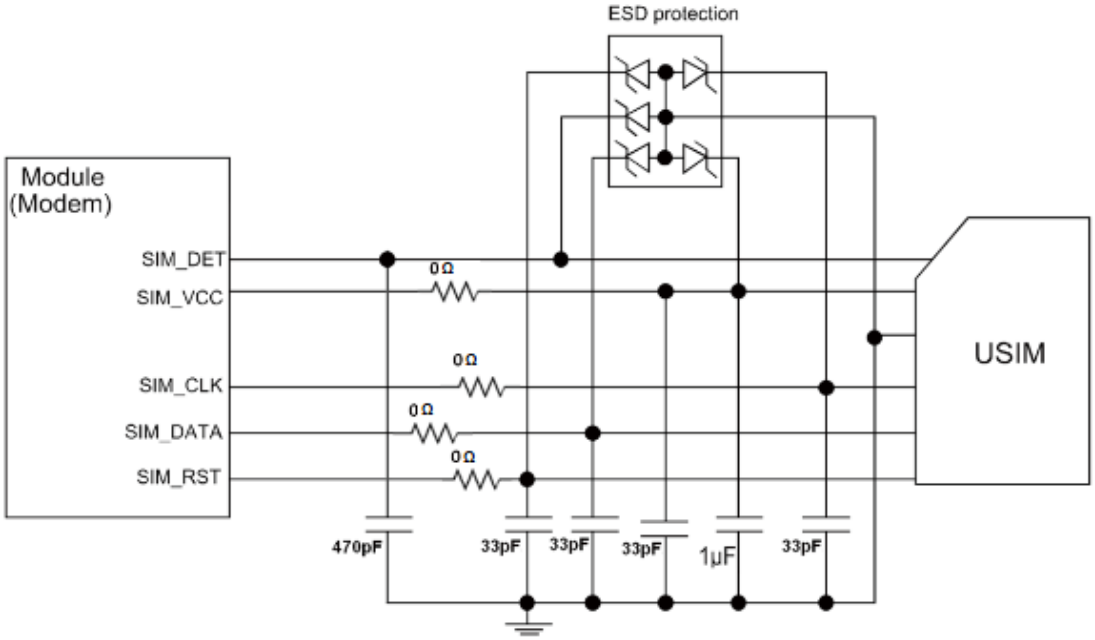

Table 3-2

Note：

1. The Capacitance of ESD protection devices on interface should below 10 PF.
2. USIM slot should be placed where far away from Antenna RF radiation.

3.6 WWAN Interface

CLM920 module provides hardware PIN to disable RF. Besides, RF also can be disabled by AT Command.

W_DISABLE Function：

NO	W_DISABLE status	Function
1	H	WWAN enable
2	L	WWAN disable
3	FLOATING	WWAN determined by AT

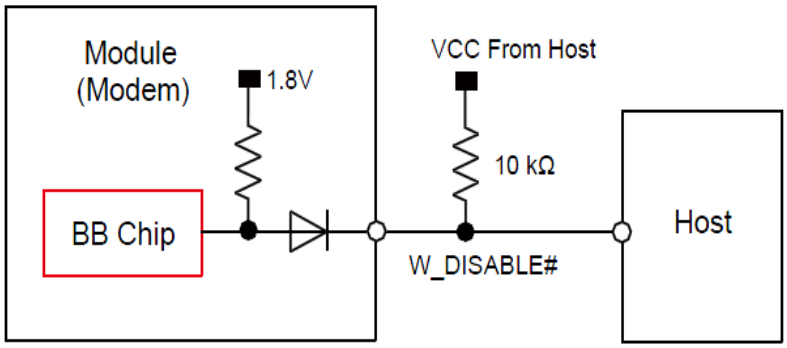

Table 3-4

3.7 WAKEUP and SUSPAND Interface

When CLM920 module is used on MID, it provides WAKEUP_AP and WAKEUP_BP function. WAKEUP_AP is module wakeup master signal，WAKEUP_BP is master wakeup module.

3.8 RF antenna interface

CLM920 module provides two RF antenna interfaces，main antenna and diversity antenna. The antenna connecting main antenna and diversity antenna must be 50Ω impedance.

In actual using, user can adjust the parameter depends on user's PCB. It can connect 68~100nH inductance to avoid static electricity. Here needs to note the antenna's impedance matching, antistatic and anti-lightning.

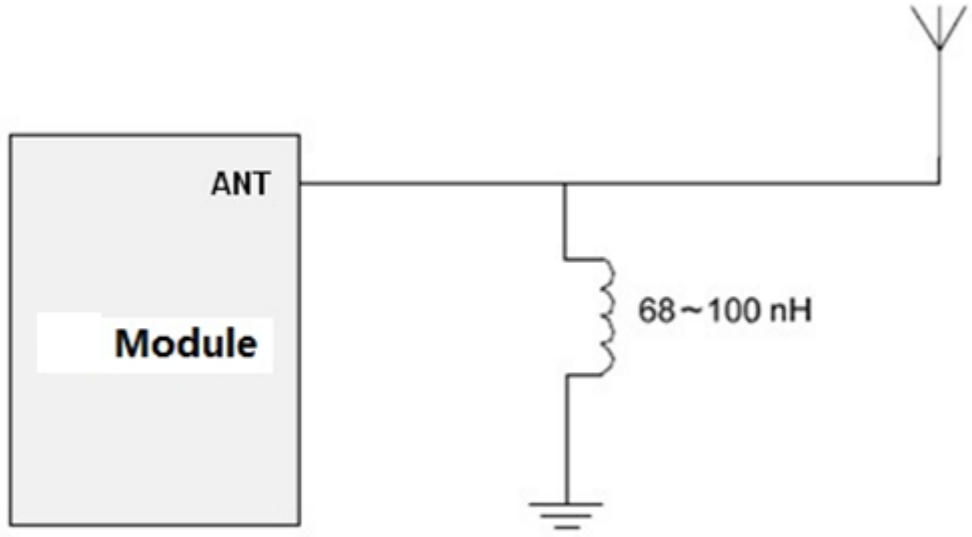

Table 3-5

4. Overall technical indicators

4.1 Outline

- Frequency
- Conducted RF testing
- Conducted sensitivity and transmit power

4.2 Frequency

Operating Band	Tx	Rx
UMTS Band I	1920 MHz–1980 MHz	2110 MHz–2170 MHz
UMTS Band II	1850 MHz–1910 MHz	1930 MHz–1990 MHz
UMTS Band V	824 MHz–849 MHz	869 MHz–894 MHz
UMTS Band VIII	880 MHz–915 MHz	925 MHz–960 MHz
GSM 850	824 MHz–849 MHz	869 MHz–894 MHz
GSM 900	880 MHz–915 MHz	925 MHz–960 MHz
GSM 1800(DCS)	1710 MHz–1785 MHz	1805 MHz–1880 MHz
GSM 1900(PCS)	1850 MHz–1910 MHz	1930 MHz–1990 MHz
LTE Band I	1920 MHz–1980 MHz	2110 MHz–2170 MHz
LTE Band II	1850 MHz–1910 MHz	1930 MHz–1990 MHz
LTE Band III	1710 MHz–1785 MHz	1805 MHz–1880 MHz
LTE Band V	824 MHz–849 MHz	869 MHz–894 MHz
LTE Band VIII	880 MHz–915 MHz	925 MHz–960 MHz
LTE Band VII	2500 MHz–2570 MHz	2620 MHz–2690 MHz
LTE Band XX	832 MHz–862 MHz	791 MHz–821 MHz

4.3 Conducted RF testing

4.3．1 Testing environment

Instrument	R&S CMU200, R&S CMW500 ,Agilent E5515C
Power	Keithley 2303, Agilent 66319
RF cable	Rosenberger Precision Microwave Cable
Murata RF coaxial cable	MXHP32HP1000

4.3．2 Testing standard

3GPP TS 51.010-1, 3GPP TS 34.121-1, 3GPP TS 36.521-1, 3GPP2 C.S0011 and 3GPP2 C.S0033. Every module is strictly tested with above standard to ensure the high quality.

4.4 Conducted sensitivity and transmit power

2G and 3G

Catalogue	Upload	Download	Power	Receiving sensitivity
GSM	824~849MHz	869~894MHz	33±2dBm	<-108.5dBm
	880~915MHz	925~960MHz	33±2dBm	<-108.5dBm
	1710~1785MHz	1805~1880MHz	30±2dBm	<-108.5dBm
	1850~1910MHz	1930~1990MHz	30±2dBm	<-108.5dBm
WCDMA	824~849MHz	869~894MHz	24+1/-3dBm	<-109dBm
	880~915MHz	925~960MHz	24+1/-3dBm	<-109dBm
	1920~1980MHz	2110~2170MHz	24+1/-3dBm	<-107dBm

4G

Catalogue	3GPP Protocol request (dBm)	Testing Sensitivity		
		MIN	Typical	MAX
LTE B1（FDD QPSK pass）95%）	< –96.3 (10 MHz)		-101	-98
LTE B3（FDD QPSK pass）95%）	< –93.3 (10 MHz)		-100	-98
LTE B7（FDD QPSK pass）95%）	< –94.3 (10 MHz)		-99	-97
LTE B8（FDD QPSK pass）95%）	< –94.3 (10 MHz)		-99	-97
LTE B20（FDD QPSK pass）95%）	< –93.3 (10 MHz)		–101	-98

Catalogue	3GPP Protocol request (dBm)	Testing Transmit Power		
		MIN	Typical	MAX
LTE B1	21 to 25	22	23	24
LTE B3	21 to 25	22	23	-24
LTE B7	21 to 25	22	23	24
LTE B8	21 to 25	22	23	24
LTE B20	21 to 25	22	23	24

5 Structure

5.1 Shape and Size

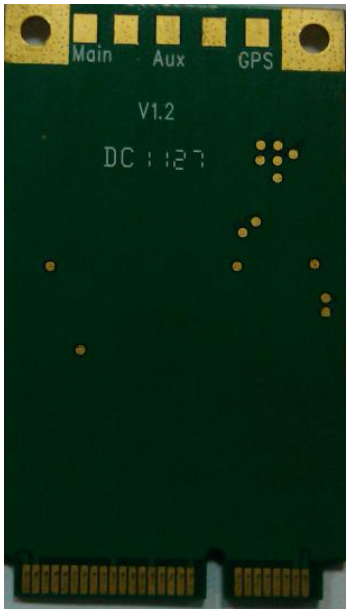

Table 5-1

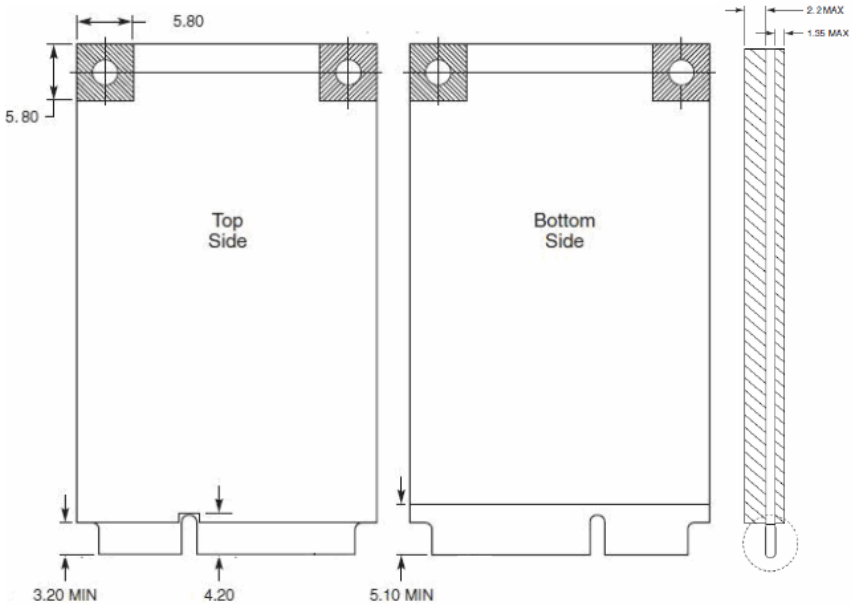

Table 5-2

5.2 Mini PCI Express Connector

CLM920 module meet the standard of PCI Express Mini Card 1.2，all the connectors that meet the

standard of PCI Express Mini Card can be used with CLM920 ， such as Molex 679100002。