MLG714C LTE Module Datasheet

Version	V1.00
Date	

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1 Overview

1.1 Overview

This chapter has outlined this MLG714C LTE module, including:

- MLG714C LTE module appearance
- MLG714C LTE module function
- Acronym

1.2 MLG714C LTE Module Appearance

MLG714C LTE module has a small and simple profile, as shown in Figure 1-1

Figure 1-1 MLG714C LTE module appearance

1.3 MLG714C LTE Module Function

The functions and characteristics of MLG714C LTE module are shown as follows:

- GCT chipset: GDM7243QT;
- Comply to 3 GPP Release10 CAT6;
- Supports inter and intra Carrier Aggregation ;
- Supports 4x4 DL-MIMO;
- Supports transmission mode: TM1/2/3/4/5/6/7/8/9;

- Support channel bandwidth of 5M/10M/15M/20M;
- Provide general Mini PCI Express interface, interface signals include:
  -Power supply
  -1 USIM card signal (Support 3.0v or 1.8v)
  -1 high speed USB3.0 interface
  -1 high speed USB2.0 interface
  -Indicator signals, etc.
- Provide 4 antenna interfaces;
- Support standard AT instruction set;
- Meet ROHS environmental requirements;

Table 1-1 MLG714C LTE module key features

Feature	Description
Working Frequency Band	TDD Band43
Maximum Transmit Power	12.5±1dBm
Operating Temperature	Operating Temperature: -30℃~ +70℃ Reduce RF performance: -40℃ ~ +70℃
	Storage Temperature: -40℃~ +85℃
Power Voltage	3.15V ~ 4.2V (Recommend 3.3V)
Consumption (Current)	Band43: MAX:600mA
AT Instruction	Support standard AT instruction set
Mini PCI Express Connector	Power and Ground
	1 USIM card signal (Support 3.0v or 1.8v)
	1 high speed USB3.0 interface and 1 high speedUSB2.0 Interface.
	Indicator signals
External Interface	4 antenna interfaces
	General Mini PCI Express interface
RoHS 2.0 Environmental Requirement	Support

1.4 Acronym

Acronym	Full Name
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
FFF	Firmware From Flash
FFH	Firmware From Host
IEC	International Electrotechnical Commission
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
NTC	Negative Temperature Coefficient
PCS	Personal Cellular System
PCI	Peripheral Component Interconnect
PDU	Packet Data Unit
PPP	Point-to-point protocol
PS	Packet Switched
QPSK	Quadrate Phase Shift Keying
TCP/IP	Transmission Control Protocol/ Internet Protocol
UART	Universal asynchronous receiver-transmitter
UIM	User Identified Module
USB	Universal Serial Bus

Figure1-2：Acronym summary

2 Interfaces

2.1 Overview

This chapter mainly introduces the external interfaces of MLG714C LTE module, including:

- General Mini PCI Express Interface
- Antenna Interface

2.2 General Mini PCI Express Interface

2.2.1 Interface Signals

Table 2-1 lists the connector pins of MLG714C.

Table 2-1Definition of interface pins

Pin No.	Pin Description	Direction to module	Comment
1	Reserved		
2	VCC3V3	P	
3	UART_TXD	O	UART transmit
4	GND	P	
5	UART_RXD	I	UART receive
6	Reserved		
7			
8	VSIM	P	USIM card power output
9	GND	P	
10	UIM_DATA	I/O	USIM card data signal
11			
12	UIM_CLK	O	USIM card clock signal
13			
14	UIM_RESET	O	USIM card reset signal

15	GND	P	
16			
17			
18	GND	P	
19			
20			
21	GND	P	
22	PERST#	I	Module reset signal
23	USB3.0_SSTX-	O	USB TX negative signal
24	VCC3V3	P	
25	USB3.0_SSTX+	O	USB TX positive signal
26	GND	P	
27	GND	P	
28			
29	GND	P	
30			
31	USB3.0_SSRX-	I	USB RX negative signal
32			
33	USB3.0_SSRX+	I	USB RX positive signal
34	GND	P	
35	GND	P	
36	USB_DM	I/O	USB negative signal
37	GND	P	
38	USB_DP	I/O	USB positive signal
39	VCC3V3	P	
40	GND	P	
41	VCC3V3	P	
42	LED1	O	(note 2)
43	GND	P	
44	LED2	O	
45			
46	LED3	O	
47			
48			

49			
50	GND	P	
51			
52	VCC3V3	P	

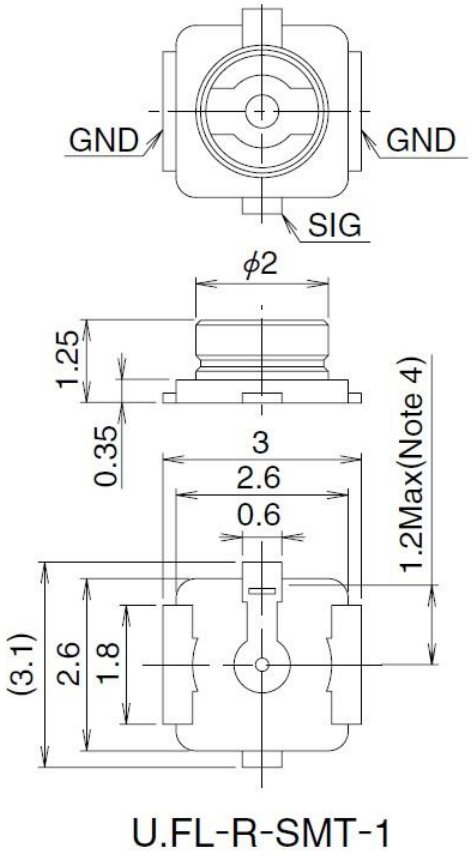
Note 1: In table 2-1, direction to module; P: power supply pin; I: digital signal input pin; O: digital signal output pin； I/O: signal input/output

Note 2: Reserved GPIO, can be customized, such like LED indicator；
Note 3: For details about the description, functions and usage methods of each pin listed in Table 2-1, please refer to the related chapters.

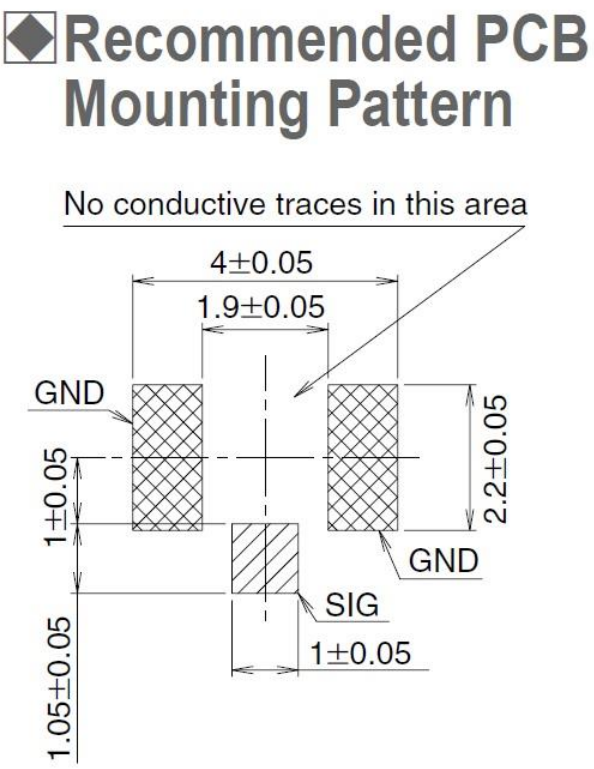
2.2 Antenna Interface

2.3.1Antenna Interface Connector

There are 4 antenna interfaces in MLG714C module respectively used for 4 antennas. U. FL- R-SMT-1 RF connector made by HRS Company is used for 4 antennas interfaces in the module. The size of RF connector is shown in Figure 2-1.



U.FL-R-SMT-1



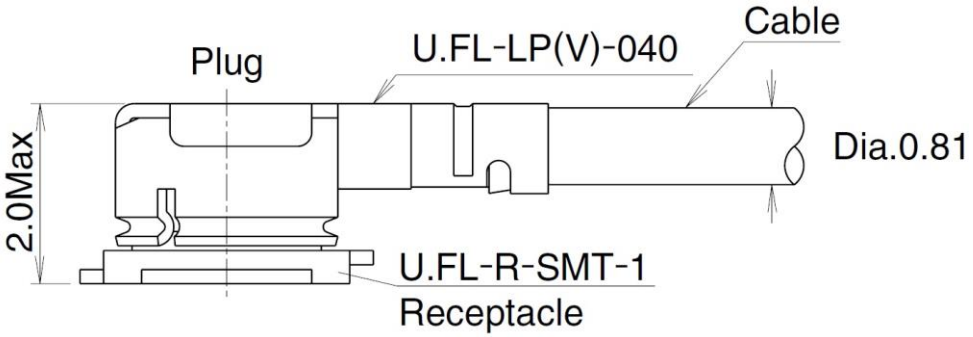


Figure 2-1RFconnectorsize

2.3.2 Typical RF Performance Characteristics

Typical RF performance Characteristics is shown in Table 2-2.

Table 2-2Typical RF performance Characteristics

	Operating Band	Transmit Power (dBm)	Antenna Interface receiving sensitivity
LTE-TDD	Band43	23±2	< –97dBm @20MHz bandwidth

*Products have 3dB redundancy

3 Interface Electrical Characteristics

3.1 Overview

This chapter introduces electrical characteristics of MLG714C LTE module interfaces, including:

- Absolute Maximum Ratings
- Operating and storage temperatures
- module IO port level requirements
- Power supply features
- Reliability
- ESD

Note

This chapter mainly describes external interfaces' electrical characteristics of MLG714CLTE module.

3.2 Absolute Maximum Ratings

MLG714Cmaximum ratings of LTE module is shown in table 3-1.

Table 3-1 MLG714C LTE module absolute maximum rating

Parameter	Description	Minimum value	Maximum value	Unit
VCC_3V3	Module Input Voltage	-0.3	5.5	V
V_{IN}	IO Port Input Voltage	-0.3	3.6	V

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

3.3 Temperature

Table 3-2Operating and storage temperature

Parameter	Description	Minimum	Maximum	Unit
To	operating temperature	-30	70	℃
Ta	Operating temperature (Reduce RF performance)	-40	70	℃
Ts	Module storage temperature	-40	85	℃
	Relative storage humidity	5%	95%	

3.4 Digital Signal DC Characteristics

MLG714C recommends the application condition as following table.

Wherein, V_{DD_IO}=3.0V。

Table 3-3 MLG714Crecommended application condition

Parameter	Description	Minimum Value	Maximum Value	Unit
V_{IH}	High-level input voltage	2	3.6	V
V_{IL}	Low-level input voltage	-0.3	0.8	V
V_{OH}	high-level output voltage	2.4	V_{DD_IO}	V
V_{OL}	low-level output voltage	0	0.4	V

3.5 Power Supply and Consumption

3.5.1Input Power Supply

For the MLG714C, the input voltage range is 3.15~4.2 V, which is supplied from the Module connector.

Table 3-4Power specifications

Parameter	Description	Minimum value	Maximum value	Unit
VCC_3V3	3.15	3.3	4.2	V

3.5.2 Power Consumption

The power consumption of MLG714C is shown as table 3-5.

Table 3-5DC power consumption (Note 4)

Parameter Description	Min	Typical	Max	Unit
Band 43		600		mA

Note 4: Unless specified otherwise, the data in the table are obtained in the following test conditions: VCC_3V3=3.3VDC, T=25℃

3.5.3 Boot Procedure

MLG714C LTE module is booted by loading power VCC_3V3;

3.6 Reliability

A part of mechanical reliability test conditions and the results of MLG714C LTE module are shown in table 3-6 below:

Table 3-6 Reliability characteristics

Item	Test Condition	Standard
Sinusoidal vibration	Frequency range:5-20Hz; PSD:1.0m^2/s^3 Frequency Range:20-200Hz, -3dB/oct Three axes, each of the axial for 1 hour	IEC 68-2-6
Shock test	Half sine ware shock acceleration: 20g Shock time: 11ms Six axes, one shock for each axial (±x, y and z)	TIA/EIA 603 3.3.5 GB/T15844.2 4.1
Temperature shock	Low temperature: -40℃±2℃ High temperature: +85℃±2℃ Changeover time：less than 30 seconds Test duration: 1 hour Repetition times: 100	IEC 68-2-14 Na ETS 300019-2-7
Damp heat cycling	High temperature: 55℃±2℃ Low temperature: +25℃±2℃ Humidity: 95% Repetition times: 4 Test duration: 12h+12h	IEC 68-2-30 Db
Low-temperature working	Temperature: -30±2℃ Test duration: 48h	IEC 68-2-1Ab
High-temperature working	Temperature: +70±2℃ Test duration: 48h	IEC 68-2-2Bb
Low-temperature storage	Temperature: -40±2℃ Test duration: 24h	IEC 68-2-1Ab
High-temperature storage	Temperature: +85±2℃ Test duration: 24h	IEC 68-2-2Bb

3.7 ESD Features

3.7.1Overview

When the MLG714C module is used, the ESD protection should be considered. The ESD performance of the MLG714C module has been tested according to the EN61000-4-2 standard. The Table 3-7 lists the test results.

Table 3-7ESDperformance

SIM card interface	Air discharge: ±8k	V
	Contact discharge: ±4k	V

Notes:

The other ports of MLG714C are not accessible to the user of the final product (since they are installed within the device) and therefore, are only protected according to the "Human Body Model" requirements.

The following sections describe the recommended circuit of the USIM card interface.

3.7.2ESD Protection of USIM Card Interface

Figure 3-1 shows the recommended ESD-protection circuit of the USIM card interface on the MLG714Cmodule. The transient voltage suppressor (TVS) diode should be placed as close to the USIM card connector as possible.

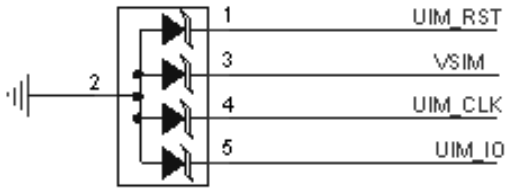


Figure 3-1Recommended ESD protection circuit of the USIM card interface

4 Interface Applications

4.1 Overview

This chapter mainly describes each interface application of MLG714C LTE module, including:

- USIM card interface
- Power interface
- USB bus
- LED status indication
- RESET interface

4.2 USIM Card Interface

The USIM is a smart card for UMTS/LTE cellular applications. The USIM provides the required subscription information to allow the mobile equipment to attach to a UMTS or LTE network. The USIM also provides the subscriber's verification procedures as well as authentication methods for network authentication during the attach procedures.

A class B (3.0 V) / class C (1.8 V) USIM card can be connected to MLG714C module. The USIM card interface signals are shown in table 4-1.

Table 4-1 USIM pins

PIN	Name	Description	Direction to Module
8	VSIM	Power source for the external USIM	Output
10	UIM_DATA	External USIM data signal	Input/output
12	UIM_CLK	External USIM clock signal	Output
14	UIM_RESET	External USIM reset signal	Output

Notes:

It is recommended that the USIM card is inserted only after the power of the module is disconnected, otherwise the USIM card can be destroyed.

USIM interface schematic reference

There is no SIM card interface circuit in MLG714C , and users need to add the USIM interface circuit. Figure 4-1 shows the definition of interface signals and the typical USIM interface schematic.

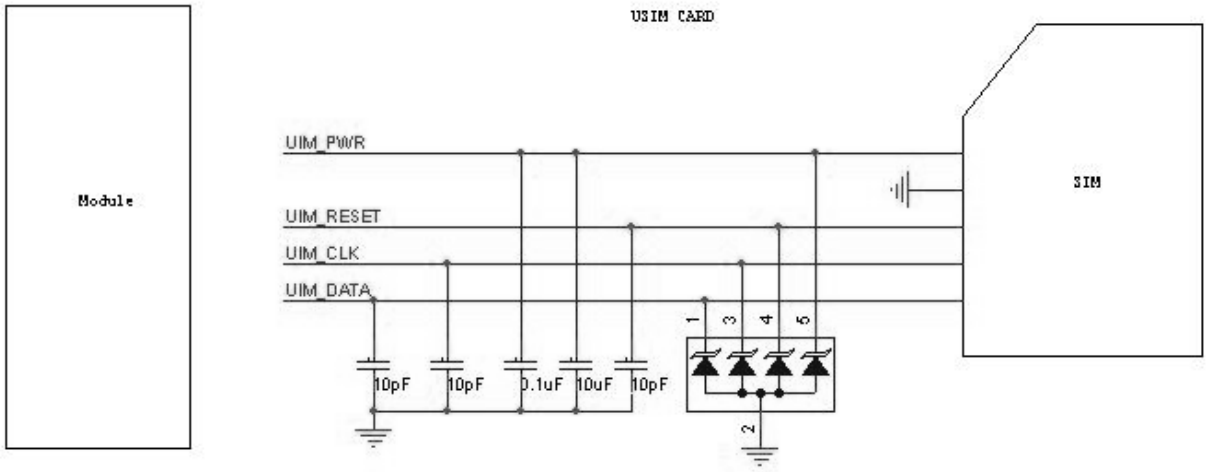
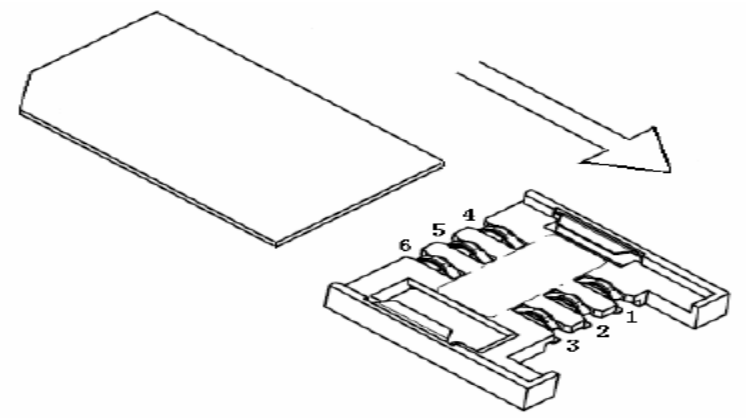


Figure 4-1USIMinterface circuit schematic on user side



pin1： VREG_USIM

pin2： USIM_RST

pin3： USIM_CLK

pin4： GND

pin5： NULL

pin6： USIM_IO

Figure 4-2Pin definition of SIM Socket

Design guide

There is an EMI filtering and ESD protection circuit between SIM card interface and module

interface on the user's board.

The SIM support clock frequencies of 3.25MHz. The SIM interface signals consist of four signals that are USIM_PWR, USIM_RST, USIM_CLK, and USIM_DATA (UIM_Vpp isn't connected also not used in many applications). Due to the relatively low clock frequencies involved, the concern is not the degradation of the SIM signals themselves. The main concern is routing of the SIM interface signals through areas considered to be of high risk for RF noise coupling (crosstalk and RF contamination) which can desensitize the radio circuitry.

- The general guidelines that should be followed are listed as follows:
- It is recommended that these signals should be routed over a contiguous ground plane.
- SIM interface signals should not be routed near high transient signals (power supply chokes and DC/DC switching FETs).
- Avoid routing of these signals near output connectors.
- Keep SIM interface signals isolated from other signals. 2x width spacing (1.5xmin) between SIM interface signals and all other signal routing is recommended.

Since the SIM is a CMOS device, ESD protection devices should be placed near to the SIM connector to provide protection before connecting to the module. In addition, all the SIM interface signals should be bypassed with a 10 pF capacitor.

4.3 Power Interface

Externally standard voltage from 3.15 V to 4.2 V (with the typical value of 3.3 V) is used as MLG714Cmodule power supply. When the network signal is very weak, the antenna emission with maximum power will happen, with 1A of transient maximum current. So it is recommended to use LDO with more than 1A or switching power supply.

Besides considering the voltage drop when high-power launching, a large capacitance should be added to the module power supply port.

Note: Because EMC interference for switching power supply is rather big, the circuit line should not be close to the antenna part.

4.4 USB Signals

MLG714C is compliant with USB 3.0 and USB2.0 high speed specification.

MLG714C uses USB drive. On the PC two ports can be mapped out, respectively:

1. 1 ACM port, carrying the AT commands, it is mainly used for data traffic;

2. 1 CDC-ECM standard card; Mainly for service information； the RNDIS interface can be customize.

4.5 Status Indication Signals

There are four GPIO pins of MLG714Cmodule. The mode LED functions as the network mode indicator and the status LED function as the signal strength indicator. The LEDs are controlled by a sink current source. The high voltage is the voltage of VCC3V3 (with the typical value of 3.3V). According to LED feature, you can adjust the LED brightness by adjusting the impedance of resistor R.

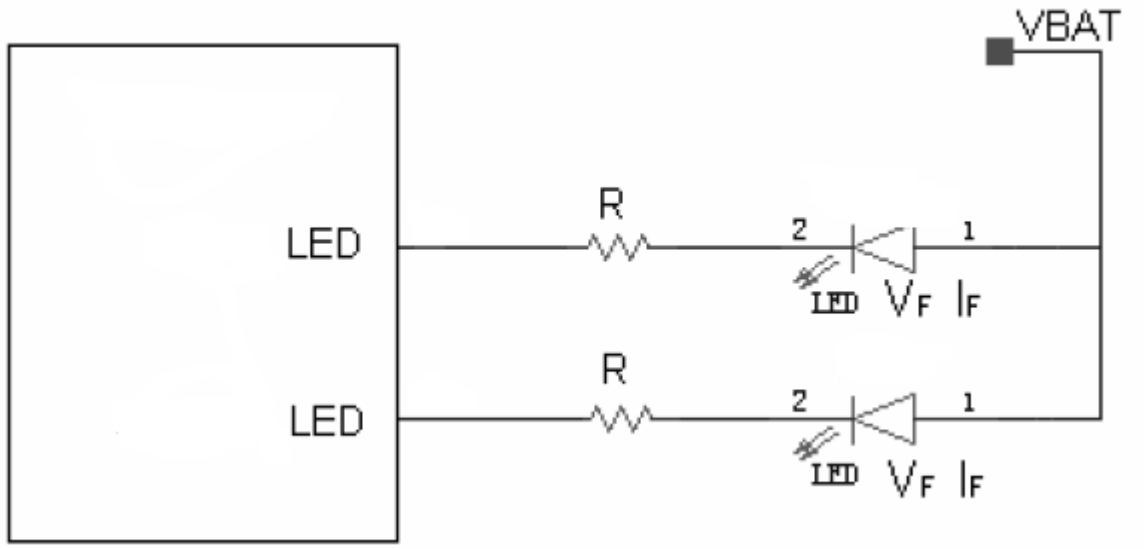


Figure 4-3Recommended circuits of the LED pins

4.6 RESET Interface

A PERST_N pin provided by MLG714Cmodule can RESET module through an external RESET circuit. Pull low RESET button (RESIN_N pin) to 100 ms, the module will be reset.

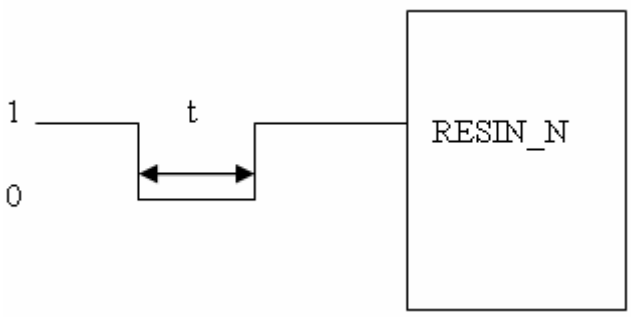


Figure 4-3：RESET interface

Note: 50 ms< t < 200ms.In addition, because the pin is rather sensitive to interference, it is important to pay attention to the module interface board line otherwise it may bring such as interference caused by module reset.

4.7 Recovery Manufacture Configuration

A FACT_RST# pin provided by MLG714C can recover manufacture configuration through pull low button to 10s.

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5 Mechanical Specifications

5.1 Overview

This chapter mainly describes mechanical specifications of MLG714Cmodule, including:

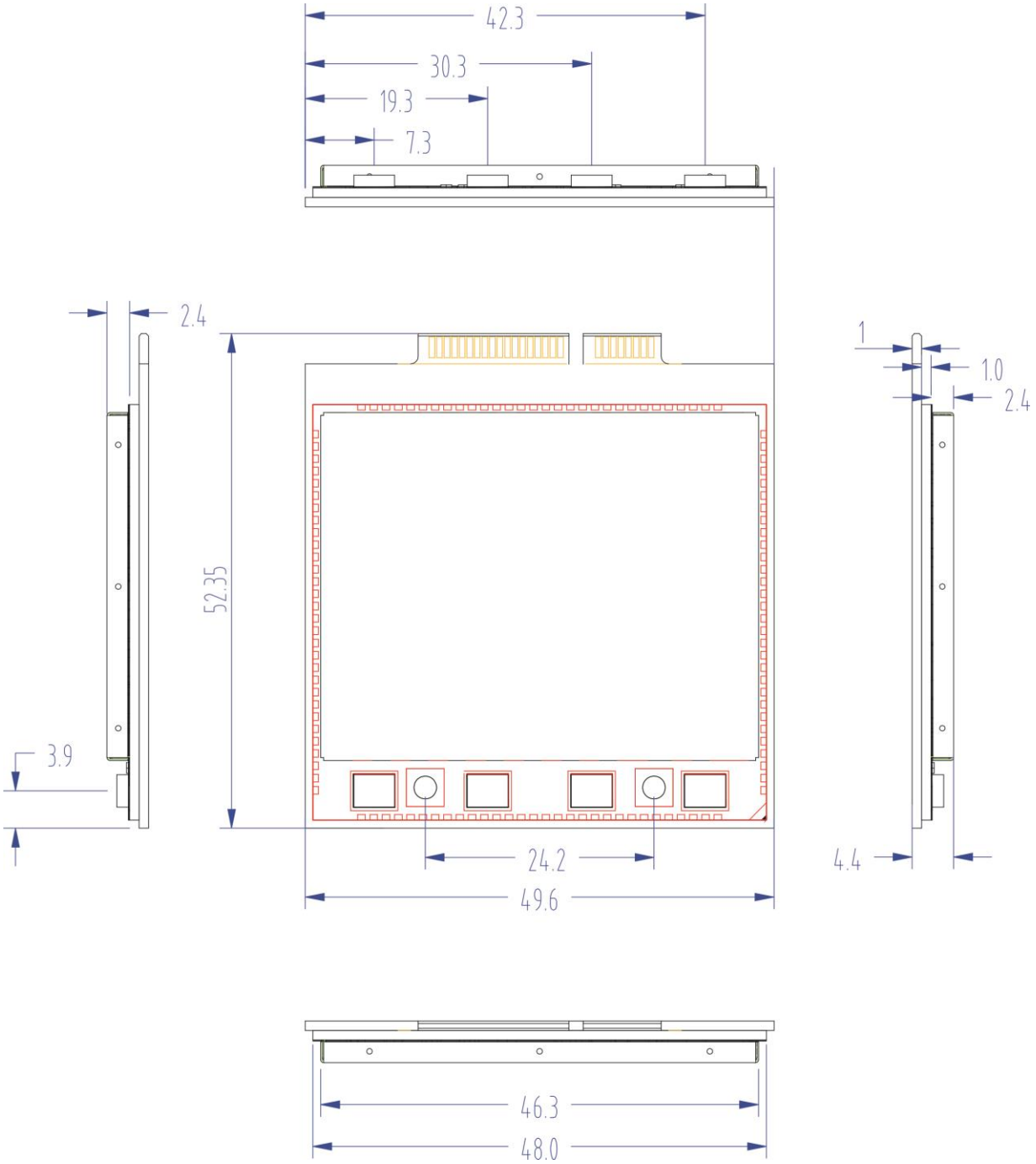
- MLG714Coverall dimensions
- Mini PCI Express overall dimensions

5.2 MLG714COverall Dimensions

Size:49.6±0.20x52.35±0.20x4.4±0.10mm

Weight:15±0.5g

The overall dimensions are shown as Figure 5-1.


42.3
30.3
19.3
7.3
2.4
52.35
3.9
1
1.0
2.4
4.4
24.2
49.6
46.3
48.0