HUAWEI MU739 HSPA+ LGA Module

Hardware Guide

Issue 01

Date 2011-08-24

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About This Document

History

Version	Date	Chapter	Descriptions
01(Draft1)	2011-06-24		Creation
01(Draft2)	2011-08-24		Updated

Summary

This document provides information about the major functions, supported services, system architecture, and technical references of HUAWEI MU739 HSPA+ LGA Module.

The following table lists the contents of this document.

Chapter	Details
1 Introduction	Describes the short introduction of the product.
2 Overall Description	Describes the Function overview, Circuit Block Diagram and Application Block Diagram of the product.
3 Description of the Application Interfaces	Describes the external application interfaces of the product.
4 RF Specifications	Describes the RF specifications of the product.
5 Electrical and Reliability Features	Describes the electrical and reliability features of the interfaces in the product.
6 Mechanical Specifications	Describes the Dimension, Label and Packing System of the product.
7 Certifications	Describes the certifications of the product.
8 Safety Information	Lists the safety information when using the product.
9 Appendix A Circuit of Typical Interface	Lists the circuit of typical interface of the product.
10 Appendix B Acronyms and Abbreviations	Lists the acronyms and abbreviations mentioned in this document.

Contents

1 Introduction

This document describes the hardware application interfaces and air interfaces that are provided when the HUAWEI MU739 HSPA+ LGA Module (hereinafter referred to as the MU739 module) is used.

This document helps you to understand the interface specifications, electrical features and related product information of the MU739 module.

MU739 module is related to the following products:

Product name	Description
MU739	WCDMA/HSDPA/HSUPA/HSPA+: 850 MHz/900 MHz/1700 MHz (AWS) /1900 MHz/2100 MHz GSM/GPRS/EDGE: 850 MHz/900 MHz/1800 MHz/1900 MHz

2 Overall Description

2.1 About This Chapter

This chapter gives a general description of the MU739 module and provides:

- Function Overview
- Circuit Block Diagram
- Application Block Diagram

2.2 Function Overview

Table 2-1 Features

Feature	Description
Physical Features	• Dimensions (L × W × H): 20 mm × 30 mm × 2.0mm (NOTE : the final vesion will be 2.0mm height, the existing samples provided may be 2.2mm height.) • Weight: less than 3.1 g
Operating Bands	WCDMA/HSDPA/HSUPA/HSPA+: 850 MHz/900 MHz/1700 MHz (AWS) /1900 MHz/2100 MHz GSM/GPRS/EDGE: 850 MHz/900 MHz/1800 MHz/1900 MHz
Operating Temperature	Normal working temperature: - 10°C ~ + 55°C
	Extreme working temperatures: - 30°C ~ - 10°C and + 55°C ~ + 75°C
Ambient Temperature for Storage	- 40°C ~ + 85°C
Moisture	RH5% ~ RH95%
Power Voltage	3.3 V ~ 4.2 V (3.8 V is recommended.)

Feature	Description
AT Commands	See the *HUAWEI MU739 HSPA+ LGA Module AT Command Interface Specification*.
Application Interface (114-pin LGA interface)	One standard Universal Subscriber Identity Module (USIM) card (3 V or 1.8 V)
	Audio: one I2S interface
	USB 2.0 (high speed)
	Power on
	Reset
	LED controlling signals x2
	Configurable General-purpose I/O (GPIO) x2
	Antenna pads x2
	Power pins
SMS	New message alert, text message receiving, and text message sending
	Management of text messages: read messages, delete messages, storage status and message list
	Supporting MO and MT. Point-to-point and cell broadcast Supporting formats of TEXT and PDU
Data Services	GSM CS: UL 14.4 kbps/DL 14.4 kbps
	GPRS:UL 85.6 kbps/DL 85.6 kbps
	EDGE: DL 236.8 kbps/UL: 236.8 kbps
	WCDMA CS: UL 64 kbps/DL 64 kbps
	WCDMA PS: UL 384 kbps/DL 384 kbps
	HSPA+: UL 5.76 Mbps/DL 21.6 Mbps
Applications	USIM PBM (Phone Book Management)
Certification Information	• European Conformity (CE) • Federal Communications Commission (FCC) • Globe Certification Forum (GCF) • PCS Type Certification Review Board (PTCRB)

NOTE

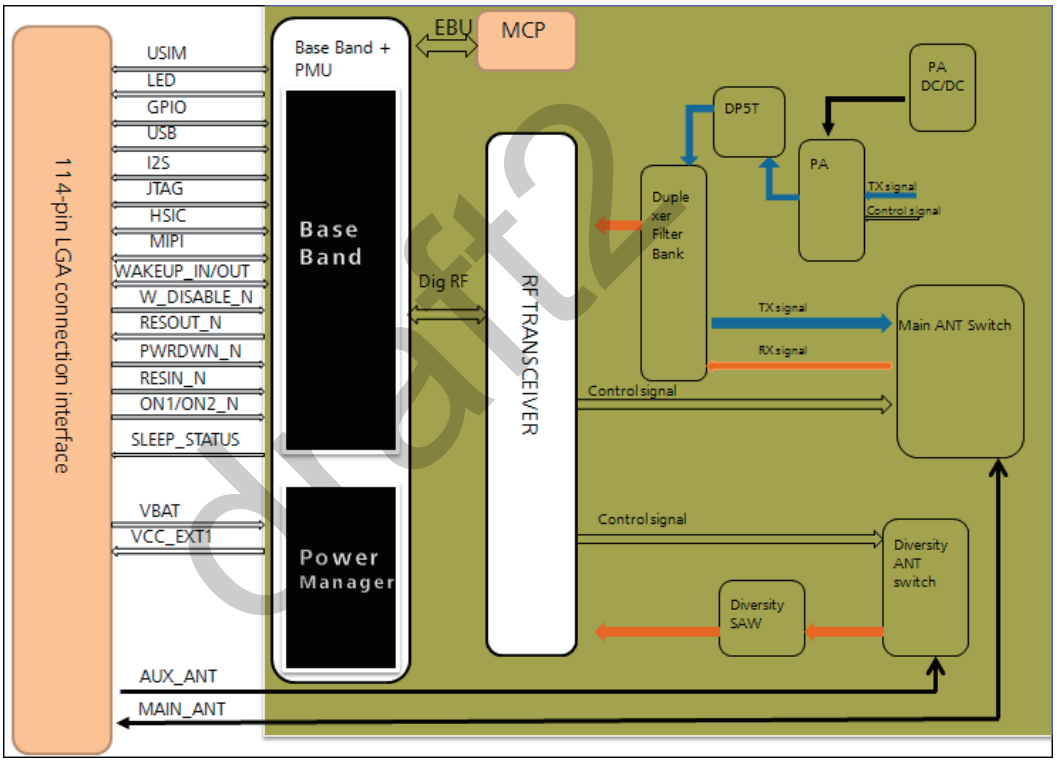
The certifications of different type of MU739 module are different because of sale markets. To get the details, please refer to ‘Chapter 7’.

2.3 Circuit Block Diagram

Figure 2-1 shows the circuit block diagram of the MU739 module. The application block diagram and major functional units of the MU739 module contain the following parts:

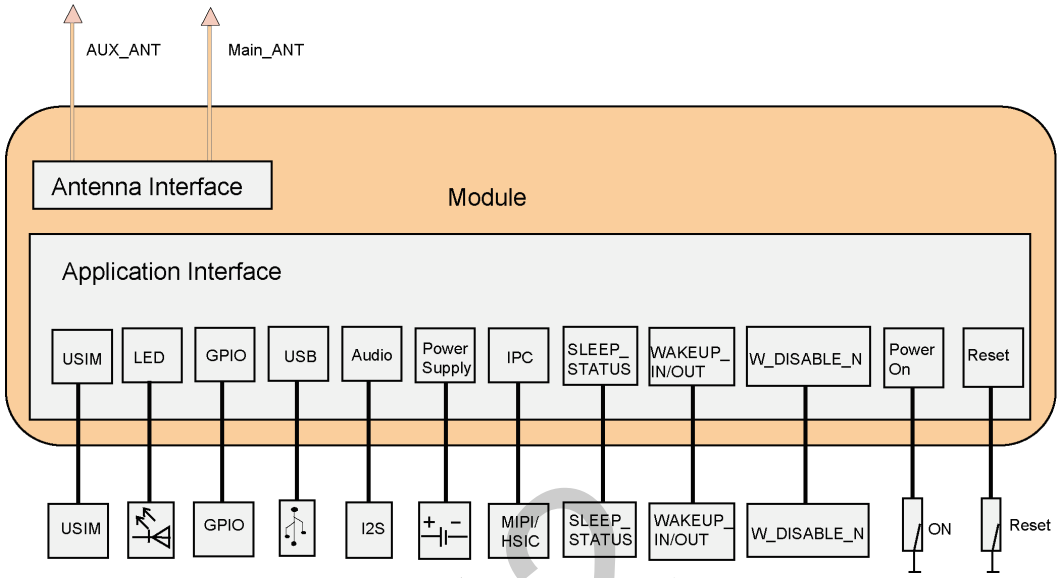
- Baseband controller
- Power manager
- Multi-chip package (MCP) memory
- Radio frequency (RF) transceiver
- RF interface
- RF PA

Figure 2-1 Circuit block diagram of the MU739 module



2.4 Application Block Diagram

Figure 2-2 Application block diagram of the MU739 module



USB Interface The USB interface supports USB 2.0 high speed standard.

USIM Interface The USIM interface provides the interface for a USIM card. The USIM card can be inserted into the host side.

Power Supply DC 3.8V is recommended.

Audio Interface The module supports one I2S interface.

RF Pad RF antenna interface

3 Description of the Application Interfaces

3.1 About This Chapter

This chapter mainly describes the external application interfaces of the MU739 module, including:

- LGA Interface
- Power Interface
- Signal Control Interface
- USB Interface
- USIM Card Interface
- Audio Interface
- IPC Interface
- General Purpose I/O Interface
- JTAG Interface
- RF Antenna Interface
- Reserved Interface
- NC Interfaces

3.2 LGA Interface

The MU739 module uses a 114-pin LGA as its external interface. For details about the module and dimensions of the LGA, see “6.2 Dimensions and Interfaces”.

Figure 3-1 shows the sequence of pins on the 114-pin signal interface of the MU739 module.

Figure 3-1 Bottom view of sequence of LGA interface pins

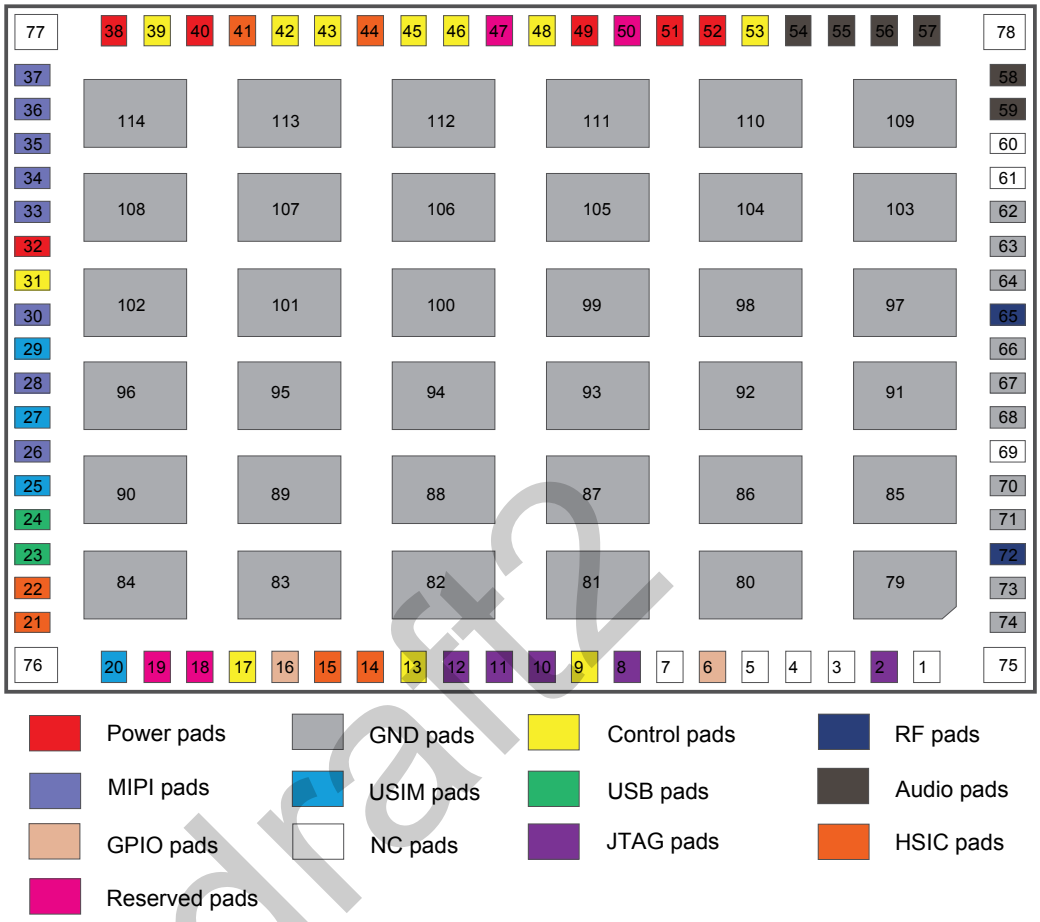


Table 3-1 shows the definitions of pins on the 114-pin signal interface of the MU739 module.

Table 3-1 Definitions of pins on the LGA interface

PIN No.	Pin Name		I/O	Description	DC Characteristics (V)		
	Normal	MUX			Min	Typical	Max
1	NC		-	No connect	-	-	-
2	JTAG_TDO		O	JTAG Serial Data Out	-0.3	1.8	2.1
3	NC		-	No connect	-	-	-
4	NC		-	No connect	-	-	-
5	NC		-	No connect	-	-	-
6	GPIO1		I/O	General I/O pins. The function of these pins has not been defined. Optional	-0.3	1.8	2.1
7	NC		-	No connect	-	-	-
8	JTAG_TRST_N		O	JTAG Reset/Module enable	-0.3	1.8	2.1
9	RESOUT_N		O	Reset output	-0.3	1.8	2.1
10	JTAG_TMS		I	JTAG State machine control signal	-0.3	1.8	2.1
11	JTAG_TDI		I	JTAG Serial Data Input	-0.3	1.8	2.1
12	JTAG_TCK		I	JTAG clock input	-0.3	1.8	2.1
13	ON1		I	Turn on the module, high active	-0.3	1.8	2.1
14	HSIC_HOST_ACTIVE		I	HSIC Host Active; Inactive: the host controller is switched off; Active: the host controller is switched on. Used to synchronize enumeration.	-0.3	1.8	2.1
15	HSIC_SLAVE_WAKE UP		I	HSIC Slave Wakeup, used by MU739 in L0 to indicate that link can be switched to L2 because MU739 has no data to transfer.	-0.3	1.8	2.1
16	GPIO2		I/O	General I/O pins. The function of these pins has not been defined. Optional	-0.3	1.8	2.1
17	SLEEP_STATUS		O	Indicates the sleep status of MU739 H: MU739 is awake, L: MU739 is in sleep	-0.3	1.8	2.1

PIN No.	Pin Name		I/O	Description	DC Characteristics (V)		
	Normal	MUX			Min	Typical	Max
18	Reserved		-	Reserve	-	-	-
19	Reserved		-	Reserve	-	-	-
20	SIM_VCC		P	power supply for USIM card	-	1.8/2.9	
21	HSIC_USB_STRB		I/O	Inter-connect USB Strobe	-0.3	1.2	1.5
22	HSIC_USB_DATA		I/O	Inter-connect USB Data	-0.3	1.2	1.5
23	USB_ DP		I/O	High-speed USB D+	-	-	-
24	USB_ DM		I/O	High-speed USB D-	-	-	-
25	SIM_RST		I	USIM Reset	0	1.8/2.9	2.1/ 3.3
26	MIPI_HSI_RX_DATA		I	MIPI HS Receive Data	-0.54	1.8	2.1
27	SIM_CLK		O	USIM Clock	0	1.8/2.9	2.1/ 3.3
28	MIPI_HSI_RX_FLG		I	MIPI HS Receive Flag	-0.54	1.8	2.1
29	SIM_DATA		I/O	USIM Data Input / Output	0	1.8/2.9	2.1/ 3.3
30	MIPI_HSI_RX_RDY		O	MIPI HS Receive Ready	-0.54	1.8	2.1
31	PWRDWN_N		I	Put the complete system (baseband, PMU and RF) into an initial state	-	1.8	-
32	USB_VBUS		P	Power supply for USB	-	3.3/5	-
33	MIPI_HSI_TX_RDY		I	MIPI HS Transmit Ready	-0.54	1.8	2.1
34	MIPI_HSI_TX_WAKE		I	MIPI HS Transmit Wake	-0.54	1.8	2.1
35	MIPI_HSI_TX_FLG		O	MIPI HS Transmit Flag	-0.54	1.8	2.1
36	MIPI_HSI_TX_DATA		O	MIPI HS Transmit Data	-0.54	1.8	2.1
37	MIPI_HSI_RX_WAKE		I	MIPI HS Receive Wake	-0.54	1.8	2.1
38	VCC_EXT1		P	1.8 V power output	1.7	1.8	1.9
39	W_DISABLE_N		I	Airplane mode	-0.3	1.8	2.1
40	VCC_IN		P	1.8 V power input	-	1.8	-
41	HSIC_HOST_WAKEUP		O	Used by MU739 to resume link from L2 or L3 to L0 when data is available on MU739.	-0.3	1.8	2.1

PIN No.	Pin Name		I/O	Description	DC Characteristics (V)		
	Normal	MUX			Min	Typical	Max
42	WAKEUP_IN		I	H: AP wakeup MU739. L: AP set MU739 to sleep mode.	-0.3	1.8	2.1
43	WAKEUP_OUT		O	Module to wake up the AP	-0.3	1.8	2.1
44	HSIC_SUSPEND_REQUEST		O	Used by CP in L0 to indicate that link can be switched to L2 because CP has no data to transfer.	-0.3	1.8	2.1
45	LED_STATUS		O	Pin for network status LED	-0.3	1.8	2.1
46	LED_MODE		O	Pin for network mode LED	-0.3	1.8	2.1
47	Reserved		-	Reserve	-	-	-
48	ON2_N		I	Turn on the module, low active	-0.3	1.8	2.1
49	VBAT_PMU		P	Battery supply, power supply for Baseband and Transceiver	3.3	3.8	4.2
50	Reserved		-	Reserve	-	-	-
51	VBAT_PA		P	Battery supply, power supply for PA	3.3	3.8	4.2
52	VBAT_PA		P	Battery supply, power supply for PA	3.3	3.8	4.2
53	RESIN_N		I	Baseband reset	-0.3	1.8	2.1
54	I2S_CLK1		O	Serial clock	-0.3	1.8	2.1
55	I2S_CLK0	PCM_CLK	O	Serial clock /PCM clock	-0.3	1.8	2.1
56	I2S_RX	PCM_DIN	I	Serial receive data /PCM Data Input	-0.3	1.8	2.1
57	I2S_TX	PCM_DOUT	O	Serial transmit data /PCM data output	-0.3	1.8	2.1
58	I2S_WA0	PCM_SYNC	O	Word alignment select /PCM interface sync	-0.3	1.8	2.1
59	I2S_WA1		O	Word alignment select	-0.3	1.8	2.1
60	NC		-	No connect	-	-	-
61	NC		-	No connect	-	-	-
62	GND		-	Ground	-	0	-

PIN No.	Pin Name		I/O	Description	DC Characteristics (V)		
	Normal	MUX			Min	Typical	Max
63	GND		-	Ground	-	0	-
64	GND		-	Ground	-	0	-
65	MAIN_ANT		-	Main antenna	-	-	-
66	GND		-	Ground	-	0	-
67	GND		-	Ground	-	0	-
68	GND		-	Ground	-	0	-
69	NC		-	No connect	-	-	-
70	GND		-	Ground	-	0	-
71	GND		-	Ground	-	0	-
72	AUX_ANT		-	Diversity antenna	-	-	-
73	GND		-	Ground	-	0	-
74	GND		-	Ground	-	0	-
75	NC		-	No connect	-	-	-
76	NC		-	No connect	-	-	-
77	NC		-	No connect	-	-	-
78	NC		-	No connect	-	-	-
79	GND		-	Ground	-	0	-
80	GND		-	Ground	-	0	-
81	GND		-	Ground	-	0	-
82	GND		-	Ground	-	0	-
83	GND		-	Ground	-	0	-
84	GND		-	Ground	-	0	-
85	GND		-	Ground	-	0	-
86	GND		-	Ground	-	0	-
87	GND		-	Ground	-	0	-
88	GND		-	Ground	-	0	-
89	GND		-	Ground	-	0	-
90	GND		-	Ground	-	0	-
91	GND		-	Ground	-	0	-
92	GND		-	Ground	-	0	-

PIN No.	Pin Name		I/O	Description	DC Characteristics (V)		
	Normal	MUX			Min	Typical	Max
93	GND		-	Ground	-	0	-
94	GND		-	Ground	-	0	-
95	GND		-	Ground	-	0	-
96	GND		-	Ground	-	0	-
97	GND		-	Ground	-	0	-
98	GND		-	Ground	-	0	-
99	GND		-	Ground	-	0	-
100	GND		-	Ground	-	0	-
101	GND		-	Ground	-	0	-
102	GND		-	Ground	-	0	-
103	GND		-	Ground	-	0	-
104	GND		-	Ground	-	0	-
105	GND		-	Ground	-	0	-
106	GND		-	Ground	-	0	-
107	GND		-	Ground	-	0	-
108	GND		-	Ground	-	0	-
109	GND		-	Ground	-	0	-
110	GND		-	Ground	-	0	-
111	GND		-	Ground	-	0	-
112	GND		-	Ground	-	0	-
113	GND		-	Ground	-	0	-
114	GND		-	Ground	-	0	-

NOTE

- **P** indicates power pins; **I** indicates pins for digital signal input; **O** indicates pins for digital signal output.
- The **NC** (No Connect) pins are internally connected to the module. Therefore, these pins should not be used, otherwise they may cause problems. Please contact us for more details about this information.

3.3 Power Interface

3.3.1 Overview

The power supply part of the MU739 module contains:

- VBAT PIN for the power supply
- SIM_VCC PIN for USIM card power output
- USB_VBUS PIN for USB power supply
- VCC_EXT1 PIN for 1.8 V power output
- VCC _IN PIN for 41~46 PIN voltage supply

Table 3-2 lists the definitions of the pins on the power supply interface.

Table 3-2 Definitions of the pins on the power supply interface

Pin No.	Signal Name	I/O	Description	DC Characteristics (V)		
				Min	Typical	Max
49	VBAT_PMU	P	Battery supply, power supply for Baseband and Transceiver	3.3	3.8	4.2
51, 52	VBAT_PA	P	Battery supply, power supply for PA	3.3	3.8	4.2
20	SIM_VCC	P	Power supply for USIM card	-	1.8/2.9	-
32	USB_VBUS	P	Power supply for USB	-	3.3/5	-
38	VCC_EXT1	P	1.8 V power output	1.7	1.8	1.9
40	VCC _IN	P	1.8 V power input	-	1.8	-
62~64, 66~68,70, 71, 73,74, 79~114	GND	-	Ground	-	0	-

3.3.2 VBAT Interface

When the MU739 module works normally, power is supplied through the VBAT_PMU and VBAT_PA pins and the voltage ranges from 3.3 V to 4.2 V (typical value is 3.8 V). The 114-pin LGA module provides one VBAT_PMU pin, two VBAT_PA pins and forty-six GND pins. To ensure that the MU739 module works normally, all the pins must be connected.

When the MU739 module is used for different applications, special attention should be paid to the design of the power supply. When the MU739 module transmits at the maximum power, the transient peak current may reach 2.0 A. In this case, the

VBAT_PA voltage droops. Make sure that the voltage does not decrease below 3.3 V in any case. Otherwise, exceptions such as reset of the MU739 module may occur.

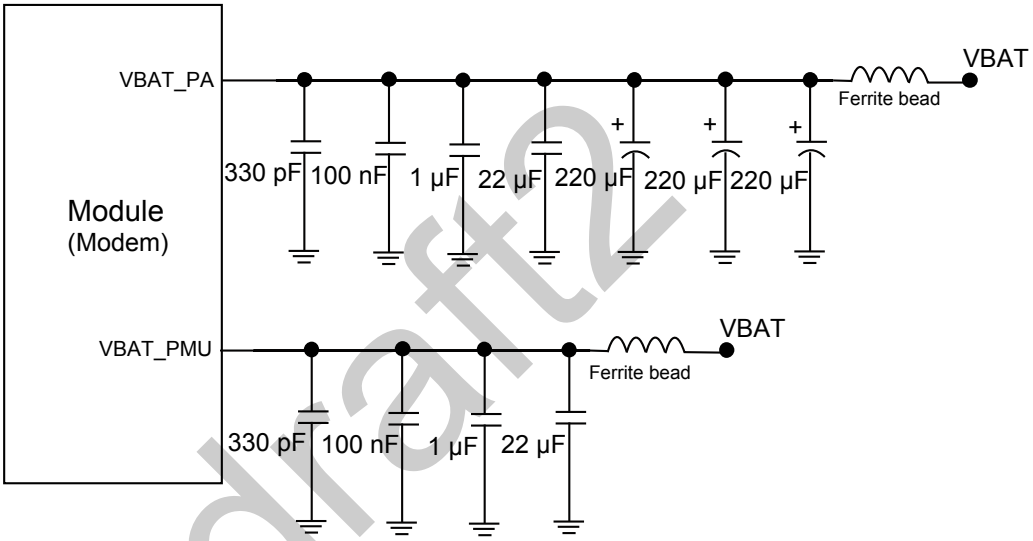
A low-dropout (LDO) regulator or switch-mode power supply with load current larger than 2 A is recommended. At least three 220 µF capacitors should be installed to VBAT_PA pins. And the trace of the power supply should be as short and wide as possible.

It is recommended to employ a ferrite bead in series on VBAT to improve the EMI performance.

FC FBMJ1608HS280NT manufactured by TAIYO YUDEN or MPZ1608S300ATAH0 manufactured by TDK is recommended.

Figure 3-2 shows the recommended power circuit of MU739 module.

Figure 3-2 Recommended power circuit of MU739 module



3.3.3 Output Power Supply Interface

Output power supply Interfaces are SIM_VCC, VCC_EXT1. Through the SIM_VCC power supply interface, the MU739 module can supply 1.8 V and 2.9 V power externally with an output current of 70 mA (typical value).The VCC_EXT1 pin can supply 1.8 V power.

3.4 Signal Control Interface

3.4.1 Overview

The signal control part of the interface in the MU739 module consists of the following:

- Power on (ON1, ON2_N) pins
- Reset output pin (RESOUT_N)
- System reset pin（PWRDWN_N）

- Hardware reset (RESIN_N) pin
- Network status LED (LED_STATUS/LED_MODE) pins
- W_DISABLE_N signal pin
- WAKEUP_IN signal pin
- WAKEUP_OUT signal pin
- SLEEP_STATUS signal pin

Table 3-3 lists the pins on the signal control interface.

Table 3-3 Pins on the signal control interface

Pin No.	Pin Name	I/O	Description	DC Characteristics(V)		
				Min	Typical	Max
13	ON1	I	Turn on the module, high active	-0.3	1.8	2.1
48	ON2_N	I	Turn on the module, low active	-0.3	1.8	2.1
9	RESOUT_N	O	Reset output	-0.3	1.8	2.1
31	PWRDWN_N	I	Put the complete system (baseband, PMU and RF) into an initial state	-	1.8	-
53	RESIN_N	I	Baseband reset	-0.3	1.8	2.1
39	W_DISABLE_N	I	Airplane mode	-0.3	1.8	2.1
45	LED_STATUS	O	Pin for network status LED	-0.3	1.8	2.1
46	LED_MODE	O	Pin for network mode LED	-0.3	1.8	2.1
42	WAKEUP_IN	I	H: AP wakeup MU739. L: AP set MU739 to sleep mode.	-0.3	1.8	2.1
43	WAKEUP_OUT	O	Module to wake up the AP	-0.3	1.8	2.1
17	SLEEP_STATUS	O	Indicates the sleep status of MU739 H: MU739 is awake, L: MU739 is in sleep	-0.3	1.8	2.1

NOTE

- It is recommended to use resistor of 0ohm in the AP side to isolate signals transmitted from above pins in Table 3-3

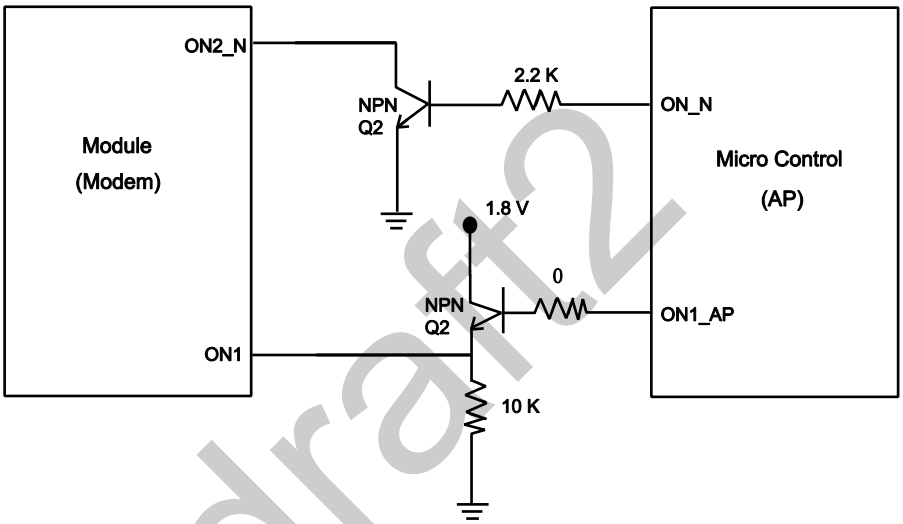
3.4.2 Input Signal Control Pins

The MU739 module implements power-on and resets the hardware through the input signal control pins. The power-on and reset control parts of the interface of the MU739 module include ON1, ON2_N interfaces signal and the baseband reset interface signal RESIN_N and the system reset signal PWRDWN_N.

The ON1 and ON2_N pins are used to implement turning on the module. The ON1 is high active and the ON2_N is low active.

ON1 can also be controlled by a host processor GPIO (with internal pull-down under reset).ON2_N can also be controlled by a host processor GPIO (with internal pull-up under reset), when tied to GND this input can be used to force an automatic boot up when power is applied or after a hard reset is performed.

Figure 3-3 Connections of ON1 and ON2_N pins



The PWRDWN_N pin is used to power down the module. When the software stops responding, the PWRDWN_N pin can be pulled down for at least 20 ms to reset the complete system (baseband, PMU and RF) into initial state.

- Active low with internal pull-up (200 KΩ)
- Initiate power down of the modem system (baseband, PMU, RF & clocks)
- All PMU LDOs are turned off except RTC LDO and PMU LDO. The PMU remains ready to handle an ON-event.

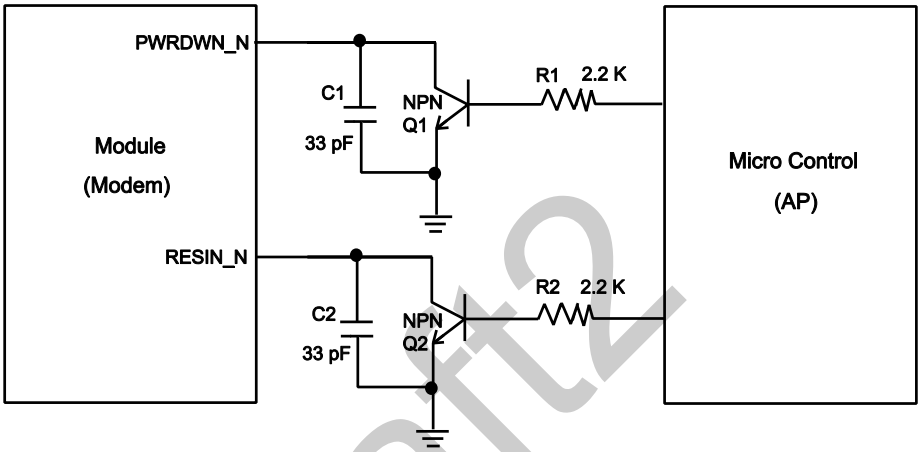
The RESIN_ N pin is used to reset the baseband with some delay. It delays the turn down to put critical blocks like EBU into a safe state before performing the reset.

- Active low without Pull-up or pull-down
- Resets baseband sub-system.
- Existing LDOs which are enabled remain enabled, disabled LDOs will power up.
- The 26 MHz clock from SMARTi-UE2 continues to be distributed according to the corresponding enable control signals.

CAUTION

As the PWRDWN_N, RESIN_N signals are relatively sensitive, it is recommended that you install a 33 pF capacitor near these pins of the interfaces for filtering. In addition, when you design a circuit on the PCB of the interface board, it is recommended that the circuit length not exceed 20 mm and that the circuit be kept at a distance of 2.54 mm (100 mil) at least from the PCB edge. Furthermore, you need to wrap the area adjacent to the signal wire with a ground wire. Otherwise, the module may be reset due to interference.

Figure 3-4 Connections of RESIN_N and PWRDWN_N pins



Power-On Time Sequence

After VBAT_PMU has been applied and is stable, the module will wait for an on-event and if the on signal is available, the module will boot up.

During power on timing, please make sure the VBAT_PMU is stable.

Figure 3-5 Power on timing sequence

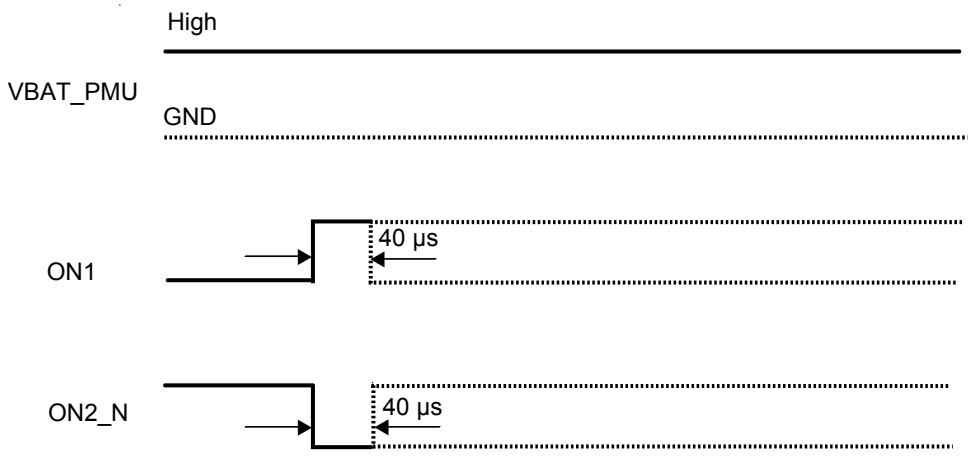


Table 3-4 Power on timing

Parameter	Comments	Time (Min values)	Units
T_{ON1}	ON1 turn on time.	40	μs
T_{ON2_N}	ON2_N turn on time	40	μs

NOTE

- Since the ON1 is high active and ON2_N is low active, you could choose one of these two pins during design.
- For detailed information about power supply design, see the *HUAWEI Module Power Supply Design Guide.*

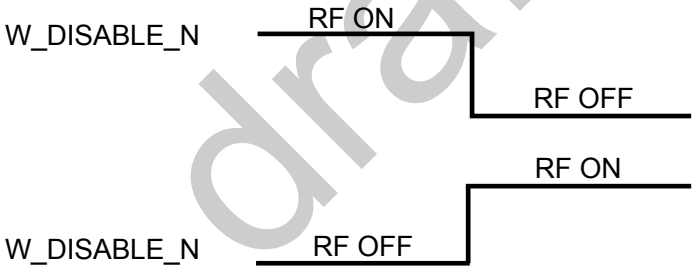
W_DISABLE_N

Low active signal.

When W_DISABLE_N Is low (asserted), the RF will be turned OFF.;

When W_DISABLE_N is high (de-asserted), the RF will be turned ON.

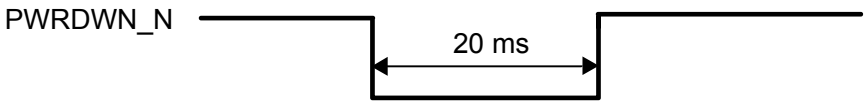
Figure 3-6 W_DISABLE_N timing



PWRDWN_N

The PWRDWN_N pin is used to reset the system.. If the software of the MU739 module fails responding, you can reset the hardware through the PWRDWN_N signal as shown in Figure 3-7 .When a low-level pulse is supplied through the PWRDWN_N pin for about 20 ms, the module will be put into the initial state. Then the software can start powering on the module and reports relevant information according to the actual settings.

Figure 3-7 Power down pulse timing



NOTE
MU739 doesn't support hardware shut down, can only be powered off by software.

WAKEUP_IN Signal

The AP controls the sleep and wakeup status of the MU739 module through the WAKEUP_IN signal.

If there is no external WAKEUP_IN signal, the wireless module keeps in the wakeup status by default. After receiving the WAKEUP_IN signal, the wireless module determines whether to enter the sleep mode according to the level status of the WAKEUP_IN signal.

Table 3-3 shows the definition of the WAKEUP_IN signal.

3.4.3 Output Signal Control Pins

The MU739 module provides two LED controlling signals: LED_STATUS and LED_MODE.

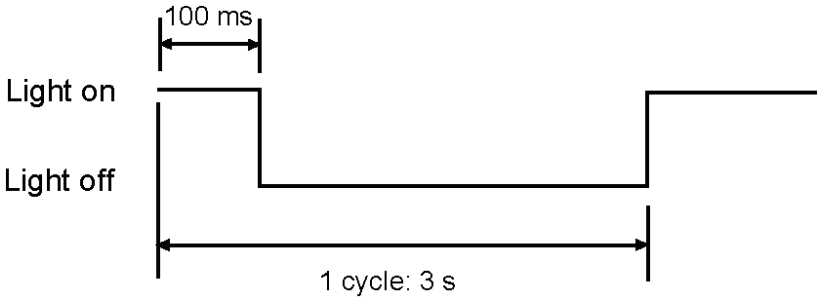
Different blinking modes of the status LED indicate different network status. Table 3-5 describes the status of the LED_STATUS pin and LED_MODE pin.

Table 3-5 List of the LED_STATUS pin and LED_MODE pin

No.	Operating Status	LED_STATUS	LED_MODE
1	The 3G network is successfully registered.	The indicator blinks once each time.	Light off
2	The dial-up connection is set up for accessing 3G data services.	Light on	Light off
3	The software is being downloaded or upgraded.	Light off	The indicator blinks fast.
4	The network is being searched for or no network is detected.	Light off	The indicator blinks twice each time.
5	The 2G network is successfully registered.	Light off	The indicator blinks once each time.
6	The dial-up connection is set up for accessing 2G data services.	Light off	Light on

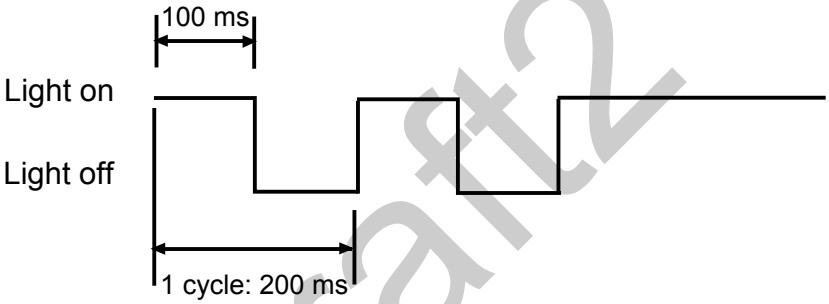
Blinking Once Each Time

Figure 3-8 Status when the indictor blinks once each time



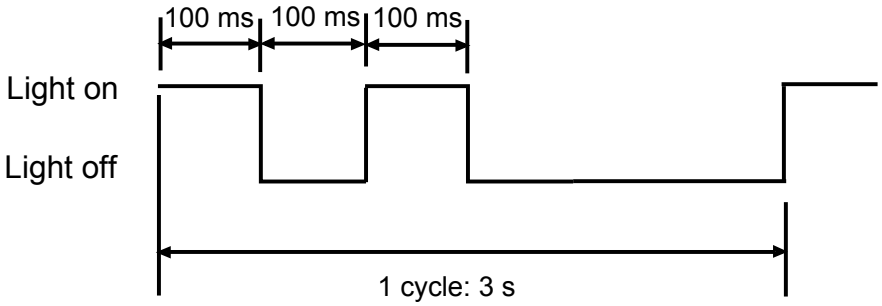
Blinking Fast

Figure 3-9 Status when the indictor blinks fast



Blinking Twice Each Time

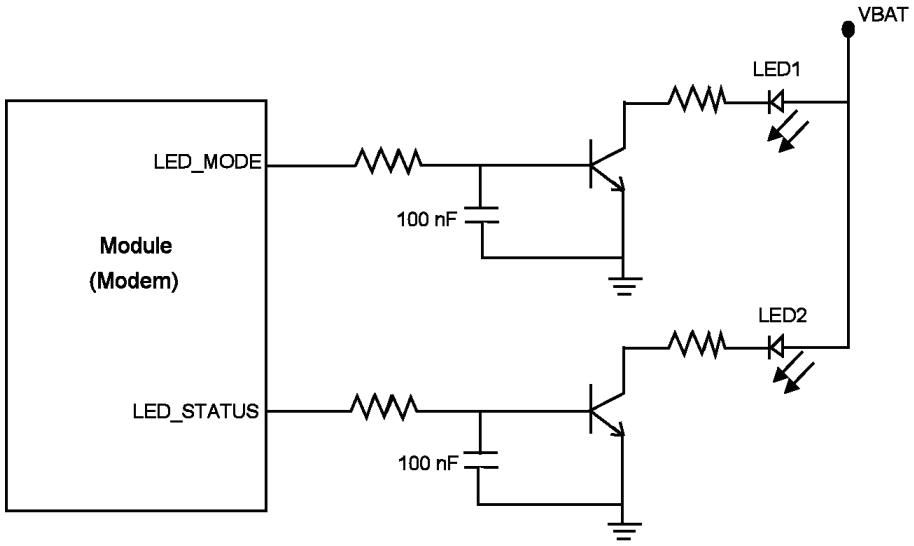
Figure 3-10 Status when the indictor blinks twice each time



External Circuits

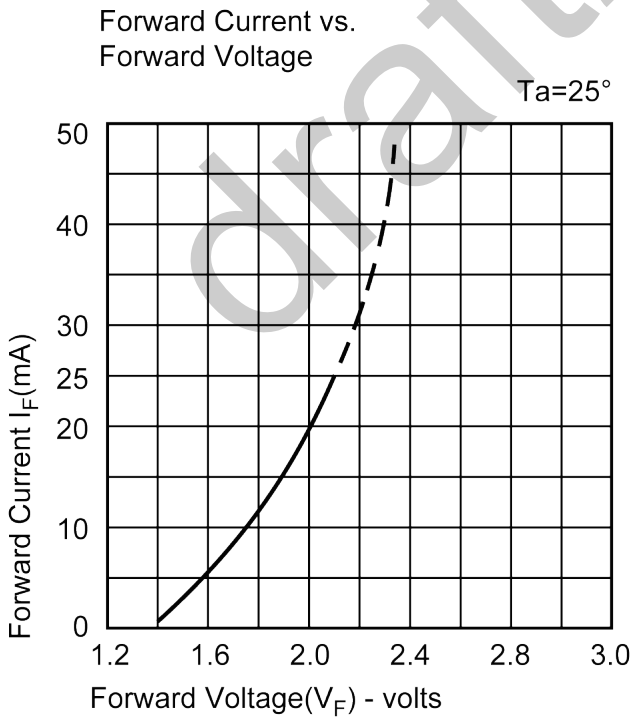
Figure 3-11 shows the recommended circuits of the LED_MODE and LED_STATUS pins. According to LED feature, you can adjust the LED brightness by adjusting the impedance of resistor.

Figure 3-11 Driving circuit



The brightness of the LED depends on the current value, and for most of the indicator lights the current from 2 mA to 5 mA is already enough.

Figure 3-12 LED Typical Electro-Optical Characteristics Curves



SLEEP_STATUS Signal

The SLEEP_STATUS signal is used to indicate the status of MU739. The AP can get to know the module is in sleep or not by reading this pin.

When SLEEP_STATUS is H, MU739 is in awake status.

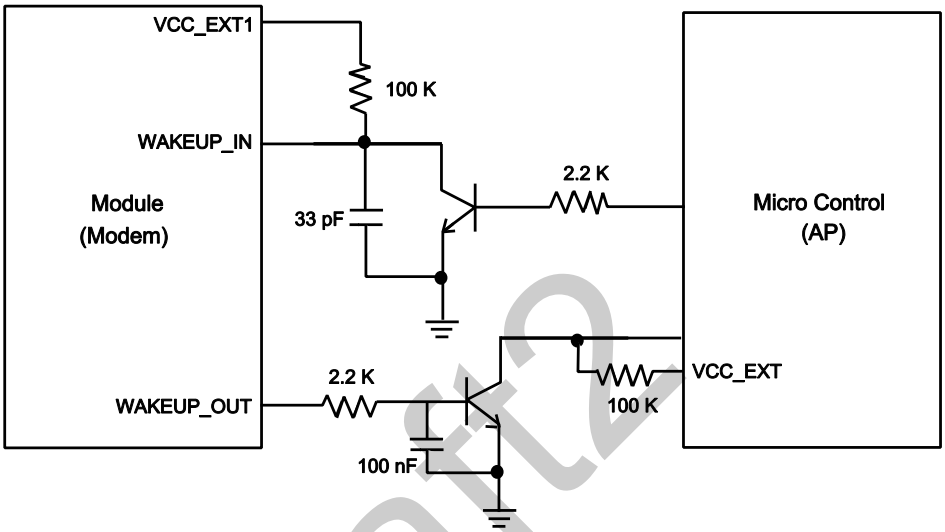
When SLEEP_STATUS is L, MU739 is in sleep status.

WAKEUP_OUT Signal

The WAKEUP_OUT signal is used to wake up the AP.

Table 3-3 shows the definition of the WAKEUP_OUT signal.

Figure 3-13 Connections of the WAKEUP_IN and WAKEUP_OUT pins



RESOUT_N

RESOUT_N is an output of the module and is used to reset the external memory MCP. Once system powers on, the RESOUT_N signal can be routed to the AP processor to allow the AP to monitor and detect resets of the modem system. During reset this signal is an output, logic low. RESOUT_N would be monitored by a host processor GPIO (with internal pull-up).

3.5 USB Interface

The MU739 is compliant with USB 2.0 high speed protocol. The USB interface is powered from the USB_VBUS (3.3V/5V typical) supply. The USB input/output lines are compatible with the USB 2.0 VBAT signal specifications. Figure 3-14 shows the circuit of the USB interface.

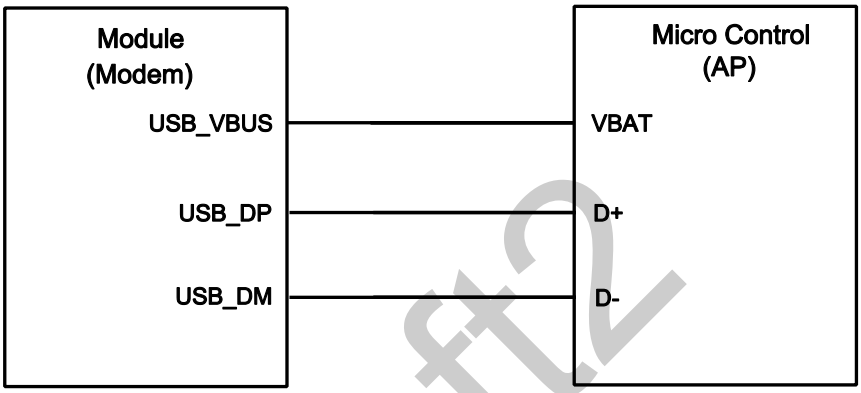
Table 3-6 Definition of the USB interface

Pin No.	Pin Name	I/O	Description	DC Characteristics (V)		
				Min	Typical	Max
23	USB_ DP	I/O	USB data signal D+	-	-	-

Pin No.	Pin Name	I/O	Description	DC Characteristics (V)		
				Min	Typical	Max
24	USB_ DM	I/O	USB data signal D-	-	-	-
32	USB_VBUS	P	Power supply for USB	-	3.3/5	-

According to USB protocol, for bus timing or electrical characteristics of MU739 USB signal, please refer to the chapter 7.3.2 of *Universal Serial Bus Specification 2.0.*

Figure 3-14 Recommended circuit of USB interface



NOTE

- 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.

3.6 USIM Card Interface

3.6.1 Overview

The MU739 module provides a USIM card interface complying with the ISO 7816-3 standard and supports automatic detection of a 3.0 V USIM card or a 1.8 V USIM card. Table 3-7 lists the USIM card interface signals.

Table 3-7 USIM card interface signals

Pin No.	Pin Name	I/O	Description	DC Characteristics (V)		
				Min	Typical	Max
20	SIM_VCC	P	Power source for the external USIM.	-	1.8/2.9	-
25	SIM_RST	I	External USIM reset signal.	0	1.8/2.9	2.1/3.3
27	SIM_CLK	O	External USIM clock signal.	0	1.8/2.9	2.1/3.3
29	SIM_DATA	I/O	External USIM data signal.	0	1.8/2.9	2.1/3.3

3.6.2 Circuit Recommended for the USIM Card Interface

As the MU739 module is not equipped with a USIM card socket, you need to place a USIM card socket on the user interface board. The USIM card signals are transmitted outwards through the 114-pin LGA interface. Figure 3-15 shows the circuit of the USIM card interface.

NOTE
There is no pull-up on SIM_DATA within MU739, an external resistor (4.7Kohm recommended) must be added between SIM_DATA and SIM_VCC

Figure 3-15 Circuit of the USIM card interface

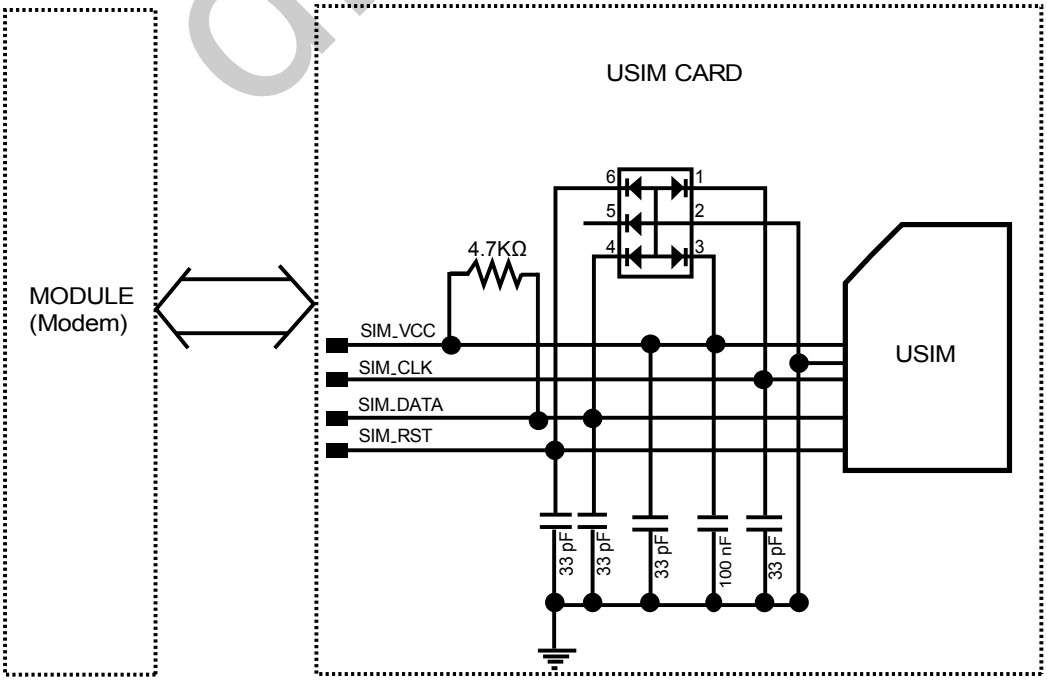
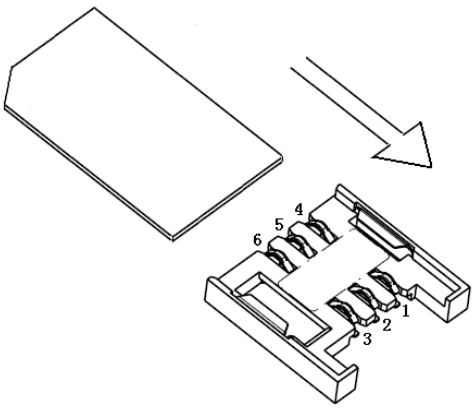


Figure 3-16 Pin definition of USIM Socket



pin1	SIM_VCC
pin2	SIM_RST
pin3	SIM_CLK
pin4	GND
pin5	NULL
pin6	SIM_DATA

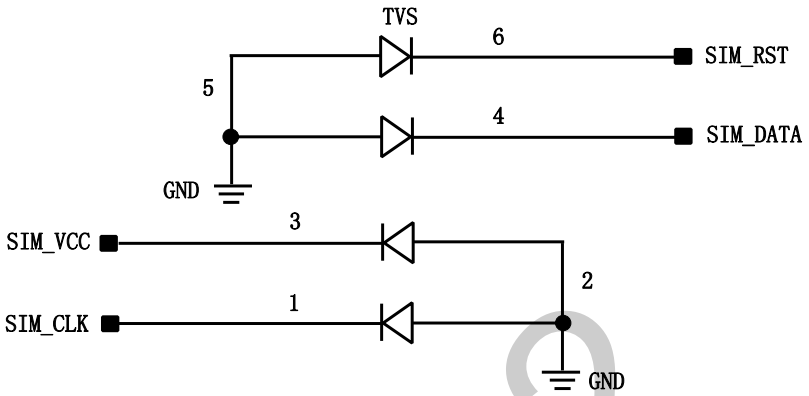
CAUTION

- To meet the requirements of 3GPP TS 51.010-1 protocols and electromagnetic compatibility (EMC) authentication, the USIM card socket should be placed near the LGA interface (it is recommended that the PCB circuit connecting the LGA interface and the USIM card socket not exceed 100 mm), because a long circuit may lead to wave distortion, thus affecting signal quality.
- It is recommended that you wrap the area adjacent to the SIM_CLK and SIM_DATA signal wires with a ground wire. The GND pin of the USIM card socket and the GND pin of the USIM card must be well connected to the power GND pin supplying power to the MU739 module.
- A 100 nF capacitor (0402 package is recommended so that larger capacitance such as 1 uFcan be employed if necessary) and a 33 pF capacitor are placed between the SIM_VCC and GND pins in a parallel manner. Three 33 pF capacitors are placed between the SIM_DATA and GND pins, the SIM_RST and GND pins, and the SIM_CLK and GND pins in parallel to filter interference from RF signals.
- You need to use a 4.7KΩ resistor pulling the SIM_DATA pin up.

3.6.3 ESD Protection for the USIM Card Interface

It is recommended that you take electrostatic discharge (ESD) protection measures near the USIM card socket. Figure 3-17 shows ESD protection circuit of the USIM card, in which the transient voltage suppressor (TVS) diode is placed as close as possible to the USIM card socket, and the GND pin of the ESD protection component is well connected to the power GND pin that supplies power to the MU739 module.

Figure 3-17 ESD protection circuit on the USIM card



3.7 Audio Interface

I2S features:

- Two supported modes: Normal mode and PCM mode
- 32-bit data path
- Interface can operate in master and slave mode
- Two independent 64 word data buffers for receiver and transmitter
- Bi-directional transmission with independent receiver and transmitter
- Two independent fractional dividers for bit clock generation for reception and transmission in master mode
- Adjustable audio sampling rate (48 KHz, 44.1 KHz, 32 KHz, 24 KHz, 22.05 KHz, 16 KHz, 12 KHz, 11.025 KHz and 8 KHz).

Table 3-8 I2S interface signals

Pin No.	Pin Name		I/O	Description	DC Characteristics (V)		
	Normal	MUX			Min	Typical	Max
54	I2S_CLK1	-	O	Serial clock	-0.3	1.8	2.1
55	I2S_CLK0	PCM_CLK	O	Serial clock	-0.3	1.8	2.1

Pin No.	Pin Name		I/O	Description	DC Characteristics (V)		
	Normal	MUX			Min	Typical	Max
56	I2S_RX	PCM_DIN	I	Serial receive data	-0.3	1.8	2.1
57	I2S_TX	PCM_DOUT	O	Serial transmit data	-0.3	1.8	2.1
58	I2S_WA0	PCM_SYNC	O	Word alignment select	-0.3	1.8	2.1
59	I2S_WA1	-	O	Word alignment select	-0.3	1.8	2.1

NOTE

- The MU739 module has reserved audio interface in hardware, but the software couldn't support this function right now. If you need, please contact us for more details about this information.

3.8 IPC Interface

The IPC (Inter Processor Communications) interface includes HSIC interface and MIPI_HSI interface.

NOTE

- The MU739 module has reserved IPC interface in hardware, but the software couldn't support this function right now. If you need, please contact us for more details about this information.

3.8.1 HSIC interface

HSIC uses 2 signals (strobe, data) in a source synchronous serial interface with 240 MHz DDR signaling to provide a 480 Mbps USB 1.2 V CMOS logic levels. Both Data and strobe are bi-directional utilizing NRZI encoding.

Table 3-9 HSIC interface

Pin No.	Pin Name	I/O	Description	DC Characteristics (V)		
				Min	Typical	Max
21	HSIC_USB_STRB	I/O	Inter-connect USB Strobe	-0.3	1.2	1.5
22	HSIC_USB_DATA	I/O	Inter-connect USB Data	-0.3	1.2	1.5

Pin No.	Pin Name	I/O	Description	DC Characteristics (V)		
				Min	Typical	Max
14	HSIC_HOST_ ACTIVE	I	HSIC Host Active; Inactive: the host controller is switched off; Active: the host controller is switched on. Used to synchronize enumeration.	-0.3	1.8	2.1
15	HSIC_SLAVE_ WAKEUP	I	HSIC Slave Wakeup, used by MU739 in L0 to indicate that link can be switched to L2 because MU739 has no data to transfer.	-0.3	1.8	2.1
41	HSIC_HOST_ WAKEUP	O	Used by MU739 to resume link from L2 or L3 to L0 when data is available on MU739.	-0.3	1.8	2.1
44	HSIC_SUSPEND_ REQUEST	O	Used by CP in L0 to indicate that link can be switched to L2 because CP has no data to transfer.	-0.3	1.8	2.1

HSIC interface is mainly used signal transfer between the IC on the board, decreasing the USB power consumption. It's recommended the PCB circuit length shorter than normal, not exceed 10 cm.

There are five status of bus conditions that are used to indicate operation.

Table 3-10 Status of bus conditions（TBD）

Condition	Strobe	Data
Idle	H	L
Connect	L	H
Resume	L	H
Suspend	H	L
Reset	L	L

3.8.2 MIPI_HSI interface

MU739 support MIPI HSI (High-speed Synchronous Serial Interfaces), the maximum data rates can reach to156 Mbps for TX and 230 Mbps for RX.

Table 3-11 IPC interface signals

Pin No.	Pin Name	I/O	Description	DC Characteristics (V)		
				Min	Typical	Max
26	MIPI_HSI_RX_ DATA	I	MIPI HS Receive Data	-0.54	1.8	2.1
28	MIPI_HSI_RX_FLG	I	MIPI HS Receive Flag	-0.54	1.8	2.1
30	MIPI_HSI_RX_ RDY	O	MIPI HS Receive Ready	-0.54	1.8	2.1
33	MIPI_HSI_TX_RDY	I	MIPI HS Transmit Ready	-0.54	1.8	2.1
34	MIPI_HSI_TX_WAKE	I	MIPI HS Transmit Wake	-0.54	1.8	2.1
35	MIPI_HSI_TX_FLG	O	MIPI HS Transmit Flag	-0.54	1.8	2.1
36	MIPI_HSI_TX_DATA	O	MIPI HS Transmit Data	-0.54	1.8	2.1
37	MIPI_HSI_RX_WAKE	I	MIPI HS Receive Wake	-0.54	1.8	2.1

3.9 General Purpose I/O Interface

The LGA module provides 2 GPIO pins for customers to use controlling signals which are worked at 1.8 V CMOS logic levels. Customers can use AT command to control the state of logic levels of eight channels GPIO output signal. See the *HUAWEI MU739 HSPA+ LGA Module AT Command Interface Specification*.

Table 3-12 Signals on the GPIO interface

Pin No.	Pin Name	I/O	Description	DC Characteristics (V)		
				Min	Typical	Max
6	GPIO1	I/O	General I/O pins. The function of these pins has not been defined. Optional	-0.3	1.8	2.1
16	GPIO2	I/O	General I/O pins. The function of these pins has not been defined. Optional	-0.3	1.8	2.1

3.10 JTAG Interface

LGA MU739 module provides one JTAG interface (Joint Test Action Group). It is recommended that set the 5 pins related to JTAG interface as test points on the AP for tracing and debug.

Table 3-13 Signals on the JTAG interface

Pin No.	Pin Name	I/O	Description	DC Characteristics (V)		
				Min	Typical	Max
2	JTAG_TDO	O	JTAG Serial Data Out	-0.3	1.8	2.1
8	JTAG_TRST_N	O	JTAG Reset/Module enable	-0.3	1.8	2.1
10	JTAG_TMS	I	JTAG State machine control signal	-0.3	1.8	2.1
11	JTAG_TDI	I	JTAG Serial Data Input	-0.3	1.8	2.1
12	JTAG_TCK	I	JTAG clock input	-0.3	1.8	2.1

NOTE
It is suggested that place the above 5 test points on the AP board for debug.

3.11 RF Antenna Interface

MU739 module provides 2 antenna interfaces for connecting the external antennas.

Table 3-14 Signals on RF Antenna interface

Pin No.	Pin Name	I/O	Description
65	MAIN_ANT	-	Main antenna
72	AUX_ANT	-	Diversity antenna

3.12 Reserved Interface

The module provides 4 reserved pins. All of reserved pins cannot be used by the customer.

Table 3-15 List of reserved pins

Pin No.	Pin Name	I/O	Description
18, 19, 47, 50	Reserved	-	Reserve

3.13 NC Interfaces

The MU739 module has 12 NC pins. All of NC interfaces should not be connected. Please keep these pins open.

Table 3-16 List of NC pins

Pin No.	Pin Name	I/O	Description
1, 3, 4, 5, 7, 60, 61, 69, 75, 76, 77, 78	NC	-	No connect

4 RF Specifications

4.1 About This Chapter

This chapter describes the RF specifications of the MU739 module, including:

- Antenna Installation Guidelines
- Operating Frequencies
- Conducted RF Measurement
- Conducted Rx Sensitivity and Tx Power
- Antenna Design Requirements

4.2 Antenna Installation Guidelines

- Install the antenna in a place covered by the signal.
- The Antenna must be installed to provide a separation distance of at least 20cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.
- Antenna must not be installed inside metal cases.
- Antenna must be installed also according Antenna manufacturer instructions.

4.3 Operating Frequencies

Table 4-1 shows the RF bands supported by MU739.

Table 4-1 RF bands

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 IV(AWS)	1710 MHz–1755 MHz	2110 MHz–2155 MHz
UMTS Band V	824 MHz–849 MHz	869 MHz–894 MHz

Operating Band	Tx	Rx
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

4.4 Conducted RF Measurement

4.4.1 Test Environment

Test instrument	R&S CMU200、Agilent E5515C
Power supply	Keithley 2303、Agilent 33619
RF cable for testing	Rosenberger Precision Microwave Cable

NOTE

- The compensation for different frequency bands relates to the cable and the test environment.
- The instrument compensation needs to be set according to the actual cable conditions.

4.4.2 Test Standards

Huawei modules meet all 3GPP test standards relating to both 2G and 3G. Each module passes strict tests at the factory and thus the quality of the modules is guaranteed.

4.5 Conducted Rx Sensitivity and Tx Power

4.5.1 Conducted Receive Sensitivity

The conducted receive sensitivity is a key parameter that indicates the receiver performance of MU739. The conducted receive sensitivity refers to the weakest signal that the module at the antenna port can receive. The BER must meet the 3GPP protocol requirements in the case of the minimum signal.

The **3GPP Protocol Claim** column in Table 4-2 lists the required minimum values, and the **Test Value** column lists the tested values of MU739.

Table 4-2 MU739 conducted Rx sensitivity (Unit: dBm)

Item		3GPP Protocol Claim (dBm)	MU739 Test Value (dBm)		
			Min	Typical	Max
GSM850	GMSK (BER<2.43%)	< - 102	-110.5	-	- 108
	8PSK (MCS5, BLER<10%)	< - 98	-105.5	-	- 101
GSM900	GMSK (BER<2.43%)	< - 102	-109.5	-	- 108
	8PSK (MCS5, BLER<10%)	< - 98	-104.5	-	- 101
GSM1800	GMSK (BER<2.43%)	< - 102	-110.5	-	- 108
	8PSK (MCS5, BLER<10%)	< - 98	-105.5	-	- 101
GSM1900	GMSK (BER<2.43%)	< - 102	-110	-	- 108
	8PSK (MCS5, BLER<10%)	< - 98	-105	-	- 101
Band I (BER<0.1%)		< - 106.7	-110.5	-	- 108
Band II (BER<0.1%)		< - 104.7	-110	-	- 108
Band IV (BER<0.1%)		< - 106.7	-110.5	-	- 108
Band VIII (BER<0.1%)		< - 103.7	-109.5	-	- 108
Band V (BER<0.1%)		< -104.7	-110.5	-	- 108

NOTE
The test values are the average of some test samples.

4.5.2 Conducted Transmit Power

The conducted transmit power is another indicator that measures the performance of MU739. The conducted transmit power refers to the maximum power that the module tested at the antenna port can transmit. According to the 3GPP protocol, the required transmit power varies with the power class.

Table 4-3 lists the required ranges of the conducted transmit power of MU739. The tested values listed in the Test Value column must range from the minimum power to the maximum power.

Table 4-3 MU739 conducted Tx power (Unit: dBm)

Item		3GPP Protocol Claim (dBm)	MU739 Test Value (dBm)		
			Min	Typical	Max
GSM850	GMSK(1Tx Slot)	31 ~ 35	31.5	32.5	33.5
	8PSK(1Tx Slot)	24 ~ 30	26	27	29
GSM900	GMSK(1Tx Slot)	31 ~ 35	31.5	32.5	33.5
	8PSK(1Tx Slot)	24 ~ 30	26	27	29
GSM1800	GMSK(1Tx Slot)	28 ~ 32	28.5	29.5	30.5
	8PSK(1Tx Slot)	23 ~ 29	25	26	28
GSM1900	GMSK(1Tx Slot)	28 ~ 32	28.5	29.5	30.5
	8PSK(1Tx Slot)	23 ~ 29	25	26	28
Band I		21 ~ 25	22.5	23.5	24.5
Band II		21 ~ 25	22.5	23.5	24.5
Band IV		21 ~ 25	22.5	23.5	24.5
Band VIII		21 ~ 25	22.5	23.5	24.5
Band V		21 ~ 25	22.5	23.5	24.5

4.6 Antenna Design Requirements

4.6.1 Antenna Design Indicators

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. To be specific, the antenna efficiency increases with the electrical dimensions. In addition, the transmission cable from the antenna port of MU739 to the antenna is also part of the antenna. The cable loss increases with the cable length and the frequency. It is recommended that the cable loss be as low as possible, for example, U.FL-LP-088 made by HRS.

The following antenna efficiency (free space) is recommended for MU739 to ensure high radio performance of the module: **Efficiency of the master antenna > 40% (–4 dB),** In addition, the efficiency should be tested with the transmission cable.

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 a vector analyzer.

The following S11 values are recommended for the antenna of MU739: **S11 of the master antenna < – 6 dB**

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 of MU739.

Radiation Pattern

The radiation pattern of an antenna reflects the radiation features of the antenna in the remote field region. The radiation pattern of an antenna commonly describes the power or field strength of the radiated electromagnetic waves in various directions from the antenna. The power or field strength varies with the angular coordinates (θ and φ), but is independent of the radial coordinates.

The radiation pattern of half wave dipole antennas is omnidirectional in the horizontal plane, and the incident waves of base stations are often in the horizontal plane. For this reason, the receiving performance is optimal.

The following radiation patterns are recommended for the antenna of MU739. **Master antenna: omnidirectional**

Gain and Directivity

The radiation pattern of an antenna represents the field strength of the radiated electromagnetic waves in all directions, but not the power density that the antenna radiates in the specific direction. The directivity of an antenna, however, measures the power density that the antenna radiates.

Gain, as another important parameter of antennas, correlates closely to the directivity. The gain of an antenna takes both the directivity and the efficiency of the antenna into account. The appropriate antenna gain prolongs the service life of relevant batteries.

The following antenna gain is recommended for MU739. **Gain of the master antenna ≤ 2.5 dBi**

NOTE

- The antenna consists of the antenna body and the relevant RF transmission cable. Take the RF transmission cable into account when measuring any of the preceding antenna indicators.
- Huawei cooperates with various famous antenna suppliers who are able to make suggestions on antenna design, for example, Amphenol, Skycross, Pulse, etc.

4.6.2 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.

Huawei is able to make technical suggestions on radio performance improvement of the module.

4.6.3 GSM/WCDMA Antenna Requirements

The antenna for MU739 must fulfill the following requirements:

GSM/WCDMA Antenna Requirements	
Frequency range	Depending on frequency band(s) provided by the network operator, the customer must use the most suitable antenna for that/those band(s)
Bandwidth	70 MHz in GSM850 80 MHz in GSM900 170 MHz in DCS 140 MHz PCS 70 MHZ in WCDMA850 80 MHz in WCDMA900 445 MHz in WCDMA1700 (AWS) 140 MHz in WCDMA1900 250 MHz in WCDMA2100
Gain	Gain < 3 dBi
Impedance	50-ohm
Input power	> 33 dBm (2 W) peak power in GSM > 24 dBm Average power in WCDMA
VSWR absolute max	<= 5
VSWR recommended	<= 2:1

Furthermore if the device is developed for the US and/or Canada market, it must comply with the FCC and/or IC requirements:

This device is to be used only for mobile and fixed application. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20cm

from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users must be provided with transmitter operation conditions for satisfying RF exposure compliance. OEM integrators must ensure that the end user has no manual instructions to remove or install the UC864-E/G/WD /WDU module. Antennas used for this OEM module must not exceed 3dBi gain for mobile and fixed operating configurations.

4.6.4 Radio Test Environment

The antenna efficiency, antenna gain, radiation pattern, total radiated power (TRP), and TIS can be tested in a microwave testing chamber.

Huawei has a complete set of OTA test environments (SATIMO microwave testing chambers and ETS microwave testing chambers). The testing chambers are certified by professional organizations and are applicable to testing at frequencies ranging from 380MHz to 6GHz. The test items are described as follows:

Passive Tests

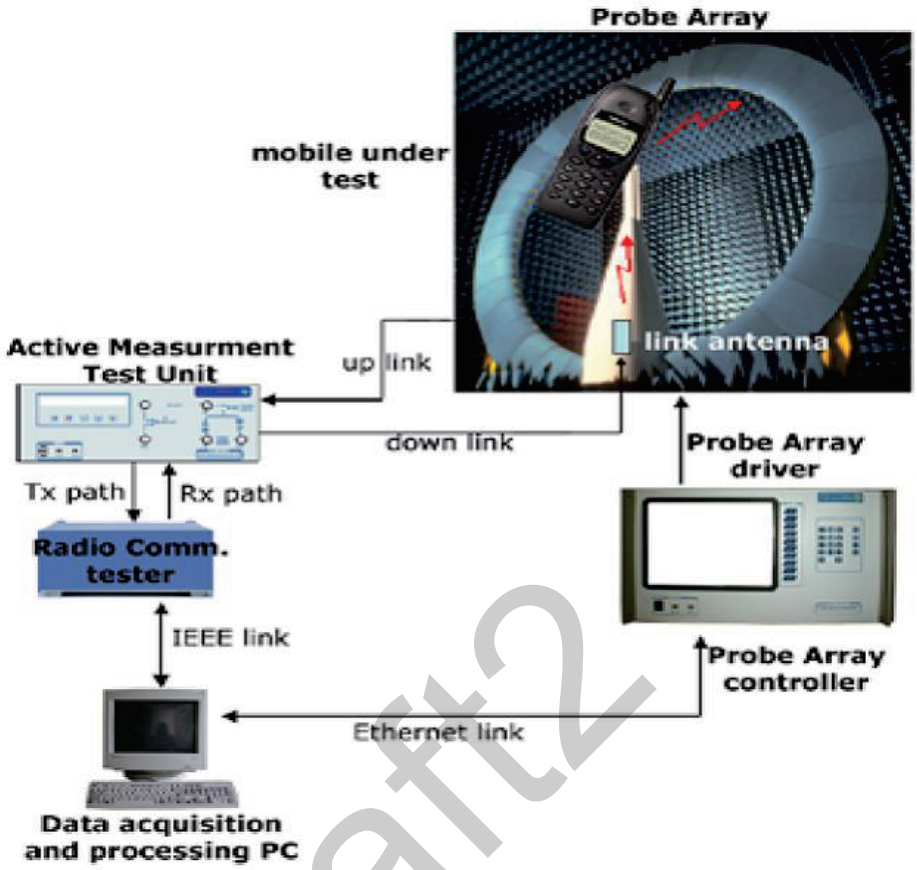
- Antenna efficiency
- Gain
- Pattern shape
- Envelope correlation coefficient

Active Tests

- **TRP:** GSM, WCDMA, CDMA, TD-SCDMA, and LTE systems
- **TIS:** GSM, WCDMA, CDMA, TD-SCDMA, and LTE systems

Figure 4-1 shows the SATIMO microwave testing chamber.

Figure 4-1 SATIMO microwave testing chamber



5 Electrical and Reliability Features

5.1 About This Chapter

This chapter describes the electrical and reliability features of the interfaces in the MU739 module, including:

- Absolute maximum ratings
- Operating and Storage Temperatures and Humidity
- Electrical Features of Application Interfaces
- Power Supply Features
- Reliability Features
- EMC and ESD Features

5.2 Absolute maximum ratings

WARNING

Table 5-1 lists the absolute maximum ratings for the MU739 module. Using the MU739 module beyond these conditions may result in permanent damage to the module.

Table 5-1 Absolute maximum ratings for the MU739 module

Symbol	Specification	Minimum Value	Maximum Value	Unit
VBAT	External power voltage	-0.3	5.5	V
V_I	Data pin voltage	-0.3	3.6	V

5.3 Operating and Storage Temperatures and Humidity

Table 5-2 lists the operating and storage temperatures and humidity for the MU739 module.

Table 5-2 operating and storage temperatures and humidity for the MU739 module

Specification	Minimum Value	Maximum Value	Unit
Normal working temperatures[1]	- 10	+ 55	°C
Extreme working temperatures[2]	-30 ~ - 10	+ 55 ~ + 75	°C
Ambient temperature for storage	- 40	+ 85	°C
Moisture	5	95	%

NOTE

[1]: When the MU739 module works at this temperature, all its RF indexes comply with the 3GPP TS 45.005 specifications.

[2]: When the MU739 module works at this temperature, certain RF indexes do not comply with the 3GPP TS 45.005 specifications.

5.4 Electrical Features of Application Interfaces

Table 5-3 Electrical features of Digital Pins in the I/O Supply Domain V_{DDP} (only EBU and MIPI_STM1)

Parameter	Description	Minimum Value	Maximum Value	Note	Unit
V_{IH}	High-level input voltage	0.7* V_{DDP}	V_{DDP} + 0.2	-	V
V_{IL}	Low-level input voltage	-0.2	0.2* V_{DDP}	-	V
V_{OH}	High-level output voltage	V_{DDP} – 0.2	-	I_{OH} = -100 μA	V
V_{OL}	Low-level output voltage	-	0.2	I_{OL} =+100 μA	V
I_{leak}	Input/ Output leakage current	-	±0.7	0.2V < V_{IN} < V_{IHmax}	μA

Table 5-4 Electrical features of Digital Pins DPLUS, DMINUS (IC-USB)

Parameter	Description	Minimum Value	Maximum Value	Note	Unit
V_{IH}	High-level input voltage	0.65 x V_{DDP_USIM}	V_{DDP_USIM} +0.3	V_{DDP_USIM} = 1.8	V
V_{IL}	Low-level input voltage	-0.3	0.35 * V_{DDP_USIM}		V
V_{IH}	High-level input voltage	2	V_{DDP_USIM} +0.3	V_{DDP_USIM} = 2.9	V
V_{IL}	Low-level input voltage	-0.3	0.8		V

Table 5-5 Electrical features of Digital Pins in the I/O supply domain of the UUSIM Interface

Parameter	Description	Minimum Value	Maximum Value	Note	Unit
V_{IH}	High-level input voltage	0.7 x V_{DDP_USIM}	3.3	V_{DDP_USIM} = 1.8,2.9V	V
V_{IL}	Low-level input voltage	0	0.2 * V_{DDP_USIM}	V_{DDP_USIM} = 1.8,2.9V	V
V_{IH}	High-level input voltage	0.7 x V_{DDP_USIM}	3.3	V_{DDP_USIM} = 1.8, 2.9V, I_{OL} = -1.0 mA	V
V_{IL}	Low-level input voltage	0	0.2 * V_{DDP_USIM}	V_{DDP_USIM} = 1.8,2.9V, I_{OL} = +1.0 mA	V
I_{leak}	Input/ Output leakage current	-	±0.7	0.2V < V_{IN} < V_{IHmax}	μA

Table 5-6 Electrical features of Digital Pins in the I/O supply domain of the USB HSIC Interface

Parameter	Description	Minimum Value	Maximum Value	Note	Unit
V_{IH}	High-level input voltage	0.65 * V_{DD_IO12}	V_{DD_IO12} + 0.3	V_{DD_IO12} = 1.2 V	V
V_{IL}	Low-level input voltage	-0.3	0.35 * V_{DD_IO12}	V_{DD_IO12} = 1.2 V	V

Parameter	Description	Minimum Value	Maximum Value	Note	Unit
VOH	High-level output voltage	0.75 * VDD_IO12	-	VDD_IO12 = 1.2 V, IOL = -2.0 mA	V
VOL	Low-level output voltage	-	0.25 * VDD_IO12	VDD_IO12 = 1.2 V, IOL = +2.0 mA	V
I_{leak}	Input/ Output leakage current	-	±0.7	0.2V < VIN < V_{IHmax}	μA

Table 5-7 Electrical features of Digital Pins in the I/O supply domain of the MIPI HSI Interface

Parameter	Description	Minimum Value	Maximum Value	Note	Unit
V_{IH}	High-level input voltage	0.7 * V_{DD_MIPI}	V_{DD_MIPI} + 0.3	V_{DD_MIPI} = 1.2 V, 1.8 V	V
V_{IL}	Low-level input voltage	-0.3 * V_{DD_MIPI}	0.35 * V_{DD_MIPI}	V_{DD_MIPI} = 1.2 V, 1.8 V	V
V_{OH}	High-level output voltage	V_{DD_MIPI}- 0.1	-	V_{DD_MIPI} = 1.2 V,I_{OL} =-100 μA	V
V_{OL}	Low-level output voltage	-	0.1	V_{DD_MIPI} = 1.2 V, I_{OL} = +100 μA	V
V_{OH}	High-level output voltage	V_{DD_MIPI} - 0.2	-	V_{DD_MIPI} = 1.8 V,I_{OL} =-100 μA	V
V_{OL}	Low-level output voltage	0.2	-	V_{DD_MIPI} = 1.8 V, I_{OL}= +100 μA	V
I_{leak}	Input/ Output leakage current	-	±0.7	0.2V < V_{IN} < V_{IHmax}	μA

5.5 Power Supply Features

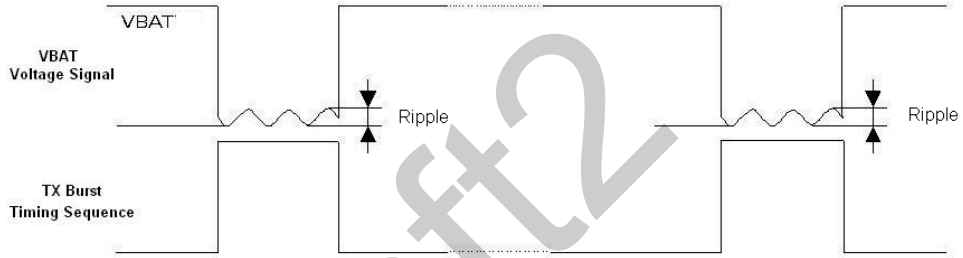
5.5.1 Input Power Supply

Table 5-8 lists the requirements for input power of the MU739 module.

Table 5-8 Requirements for input power of the MU739 module

Parameter	Minimum Value	Typical Value	Maximum Value	Ripple	Unit
VBAT	3.3	3.8	4.2	0.05	V

Figure 5-1 Power Supply During Burst Emission



NOTE

The VBAT Minimum Value must be guaranteed during the burst (with 2.75 A Peak in GSM, GPRS or EGPRS mode).

Table 5-9 Requirements for input current of the MU739 module

Power	Peak (Maximum)	Normal (Maximum)
3.8 V	2750 mA	1100 mA

5.5.2 Power Consumption

The power consumptions of MU739 in different scenarios are respectively listed in Table 5-10 , Table 5-11 and Table 5-12 .

The power consumption listed in this section is tested when the power supply of MU739 module is 3.8 V. Typical values are measured at room temperature, and minimum and maximum values are measured over the entire operating temperature range.

Table 5-10 Averaged standby DC power consumption

Description	Bands	Test Value	Units	Notes/Configuration
Standby current consumption with Sleep mode activated-Suspend (assumes USB bus is fully suspended during measurements)				
HSPA+ / WCDMA	UMTS bands	1.8	mA	DRX cycle = 8 (2.56 s)
GSM/ GPRS / EDGE	GSM bands	2.15	mA	MFRMS = 5 (1.175 s)
HSPA+ / WCDMA	UMTS bands	50	mA	Module power up and idle DRX cycle = 8 (2.56 s)
GSM/ GPRS / EDGE	GSM bands	60	mA	Module power up and idle MFRMS = 5 (1.175 s)

Table 5-11 DC power consumption (HSPA/WCDMA)

Description	Band	Test Value	Units	Power (dBm)
WCDMA	Band I (IMT2100)	175	mA	1 dBm Tx Power
		215		10 dBm Tx Power
		570		24 dBm Tx Power
	Band II (PCS 1900)	175	mA	1 dBm Tx Power
		220		10 dBm Tx Power
		640		24 dBm Tx Power
	Band IV (AWS)	170	mA	1 dBm Tx Power
		210		10 dBm Tx Power
		560		24 dBm Tx Power
	Band V (850 MHz)	170	mA	1 dBm Tx Power
		205		10 dBm Tx Power
		520		24 dBm Tx Power
	Band VIII (900 MHz)	165	mA	1 dBm Tx Power
		205		10 dBm Tx Power
		540		24 dBm Tx Power
HSPA+	Band I (IMT2100)	190	mA	1 dBm Tx Power
		230		10 dBm Tx Power
		580		24 dBm Tx Power

Description	Band	Test Value	Units	Power (dBm)
	Band II (PCS 1900)	190	mA	1 dBm Tx Power
		240		10 dBm Tx Power
		650		24 dBm Tx Power
	Band IV (AWS)	190	mA	1 dBm Tx Power
		230		10 dBm Tx Power
		580		24 dBm Tx Power
	Band V (850 MHz)	185	mA	1 dBm Tx Power
		220		10 dBm Tx Power
		540		24 dBm Tx Power
	Band VIII (900 MHz)	185	mA	1 dBm Tx Power
		225		10 dBm Tx Power
		580		24 dBm Tx Power

Table 5-12 DC power consumption (GSM/GPRS/EDGE)

Description	Test Value	Units	PCL	Configuration
GPRS850	230	mA	5	1 Up/1 Down
	395			2 Up/1 Down
	600			4 Up/1 Down
	95	mA	10	1 Up/1 Down
	125			2 Up/1 Down
	165			4 Up/1 Down
GPRS900	225	mA	5	1 Up/1 Down
	390			2 Up/1 Down
	580			4 Up/1 Down
	95	mA	10	1 Up/1 Down
	125			2 Up/1 Down
	165			4 Up/1 Down
GPRS1800	190	mA	0	1 Up/1 Down
	310			2 Up/1 Down
	375			4 Up/1 Down

Description	Test Value	Units	PCL	Configuration
	90	mA	10	1 Up/1 Down
	110			2 Up/1 Down
	145			4 Up/1 Down
GPRS1900	180	mA	0	1 Up/1 Down
	295			2 Up/1 Down
	360			4 Up/1 Down
	90	mA	10	1 Up/1 Down
	110			2 Up/1 Down
	145			4 Up/1 Down
EDGE850	175	mA	8	1 Up/1 Down
	285			2 Up/1 Down
	430			4 Up/1 Down
	120	mA	15	1 Up/1 Down
	175			2 Up/1 Down
	270			4 Up/1 Down
EDGE900	175	mA	8	1 Up/1 Down
	280			2 Up/1 Down
	420			4 Up/1 Down
	120	mA	15	1 Up/1 Down
	175			2 Up/1 Down
	265			4 Up/1 Down
EDGE1800	160	mA	2	1 Up/1 Down
	260			2 Up/1 Down
	400			4 Up/1 Down
	110	mA	10	1 Up/1 Down
	155			2 Up/1 Down
	230			4 Up/1 Down
EDGE1900	155	mA	2	1 Up/1 Down
	250			2 Up/1 Down
	380			4 Up/1 Down
	110	mA	10	1 Up/1 Down

Description	Test Value	Units	PCL	Configuration
	155			2 Up/1 Down
	230			4 Up/1 Down

NOTE

- In idle mode, the module is registered to the network, USB bus is active, and no voice or data call connection is ongoing.
- The above values are the average of some test samples.

5.6 Reliability Features

Table 5-13 lists the test conditions and results of the mechanical reliability of the MU739 module.

Table 5-13 Test conditions and results of the mechanical reliability of the MU739 module

Item	Test Condition	Standard
Low-temperature storage	Temperature: –40ºC ± 2ºC Test duration: 24 h	IEC60068
High-temperature storage	Temperature: 85ºC ± 2ºC Test duration: 24 h	IEC60068
Low-temperature working	Temperature: - 30ºC ± 2ºC Test duration: 24 h	IEC60068
High-temperature working	Temperature: 75ºC ± 2ºC Test duration: 24 h	IEC60068
Damp heat cycling	High temperature: 55ºC ± 2ºC Low temperature: 25ºC ± 2ºC Humidity: 95% Repetition times: 4 Test duration: 12 h + 12 h	IEC60068
Temperature shock	Low temperature: - 40ºC ± 2ºC High temperature: 85ºC ± 2ºC Temperature change interval: < 30s Test duration: 15 min Repetition times: 100	IEC60068

Item	Test Condition	Standard
Salty fog test	Temperature: 35°C Density of the NaCl solution: 5% ± 1% Spraying interval: 8 h Duration of exposing the module to the temperature of 35°C: 16 h	IEC60068
Sine vibration	Frequency range: 5 Hz to 200 Hz Acceleration: 10 m/s^2 Frequency scan rate: 1 oct/min Test period: 3 axial directions. Five circles for each axial direction.	IEC60068
Shock test	Half-sine wave shock Peak acceleration: 300 m/s^2 Shock duration: 11 ms Test period: 6 axial directions. One shock for each axial direction.	IEC60068
Clash test	Half-sine wave Peak acceleration: 180 m/s^2 Pulse duration: 6 ms Repetition time: 6 directions. 1000 times for each direction.	IEC60068
Drop test	First case: 0.3 m in height. Drop the MU739 module on the marble terrace with one surface facing downwards twice. Six surfaces should be tested. Second case: 0.8 m in height. Drop the MU739 module on the marble terrace with one surface facing downwards twice. Six surfaces should be tested.	IEC60068

5.7 EMC and ESD Features

EMC tests have to be performed on the application as soon as possible to detect any potential problems.

Special attention should be paid to the following:

- Possible harmful emissions radiated by the application to the RF receiver in the receiver band.
- ESD protection is mandatory on all signals which are externally accessible
- Typically, ESD protection is mandatory for the following:

  - USIM (if accessible from outside)
  - Serial link
  - USB
  - Audio
- Length of the USIM interface lines (preferably <10 cm).
- EMC protection on audio input/output (filters against 900MHz emissions).
- Biasing of the microphone inputs.
- Ground plane: HUAWEI Wireless recommends a common ground plane for analog/digital/RF grounds.
- A metallic case or plastic casing with conductive paint is recommended, except for the area around the antenna.

NOTE

The HUAWEI MU739 Module does not include any protection against over voltage.

6 Mechanical Specifications

6.1 About This Chapter

This chapter describes the following aspects of the MU739 module:

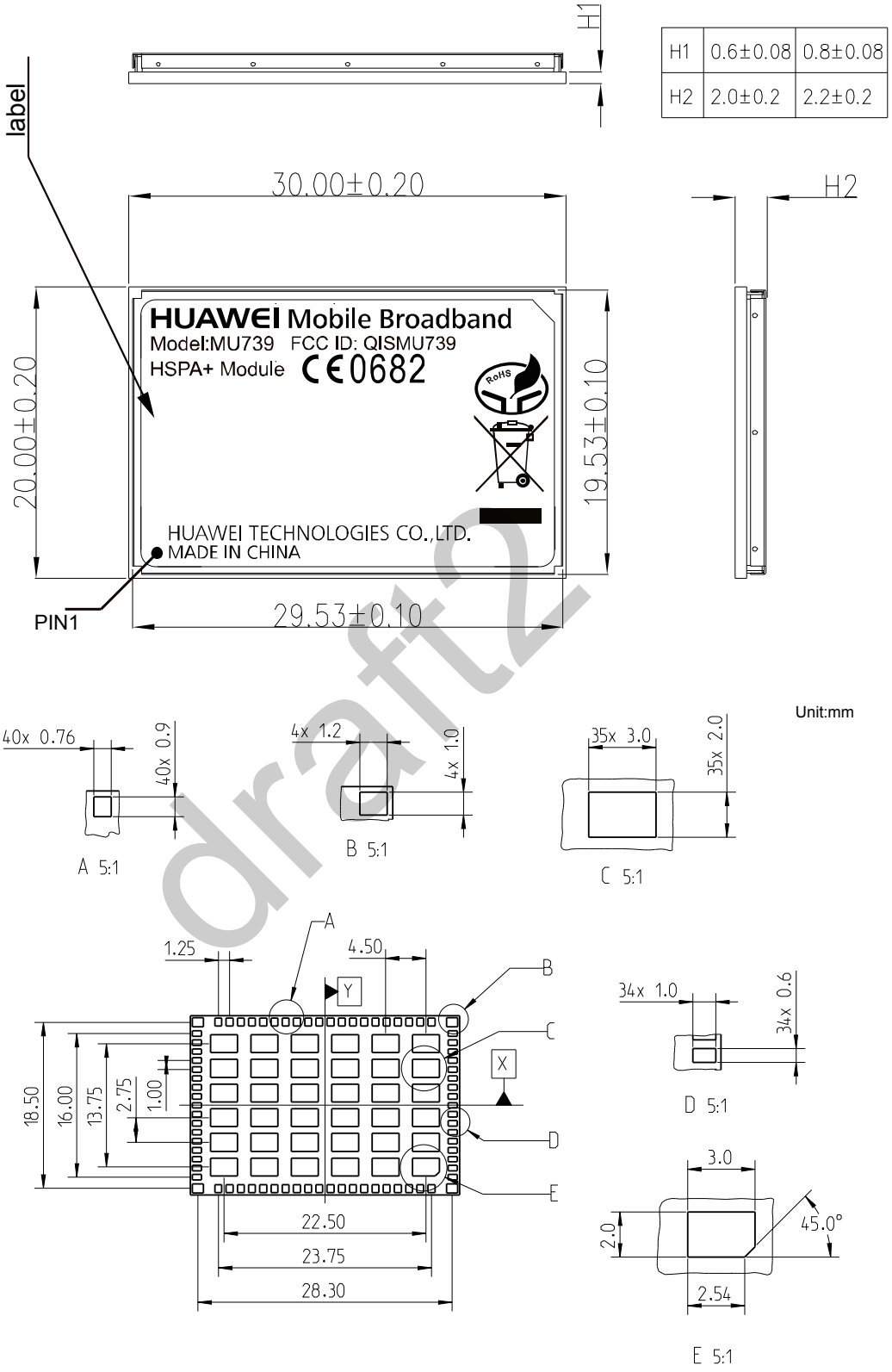
- Dimensions and Interfaces
- Customer PCB Pad Design
- Label
- Packing System

6.2 Dimensions and Interfaces

Figure 6-1 shows the dimensions of MU739 in details.

NOTE
The final version will be with 0.6mm PCB, but the temperory samples are with 0.8mm PCB.

Figure 6-1 Dimensions of MU739

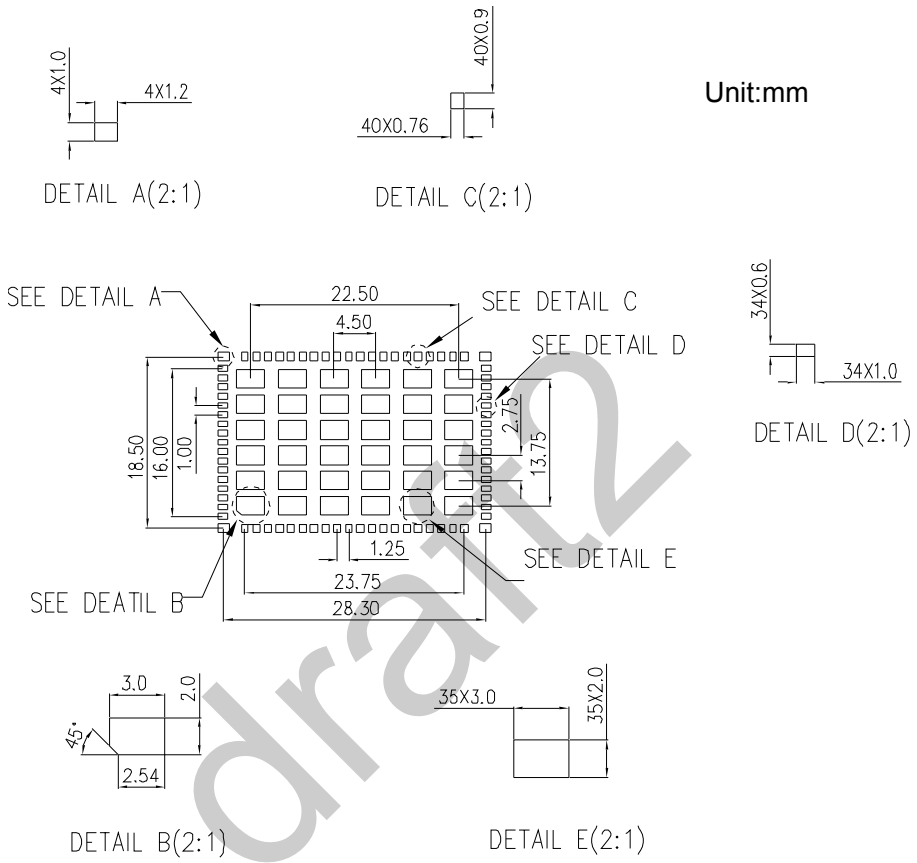


6.3 Customer PCB Pad Design

To achieve assembly yields and solder joints of high reliability, it is recommended that the customer PCB pad sizes be designed as the same as MU739's LGA pads.

For details, see Figure 6-2 .

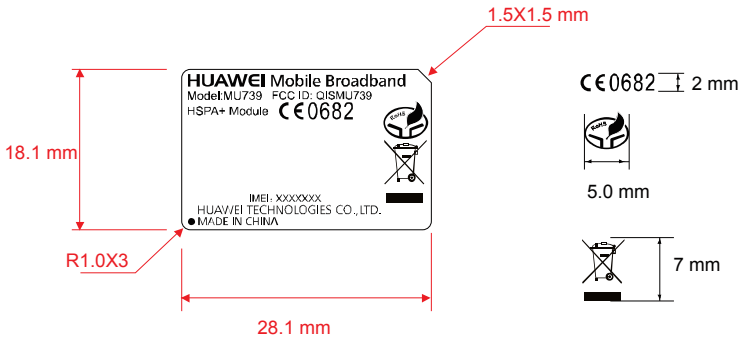
Figure 6-2 PCB pad design



6.4 Label

The label is made from deformation-resistant, fade-resistant, and high-temperature-resistant material and is able to endure the high temperature of 260°C.

Figure 6-3 MU739 label



NOTE

- The picture mentioned above is only for reference.
- The silk-screen should be clear, without burrs, and dimension should be accurate.
- The material and surface finishing and coatings which used have to make satisfied with the EU WEEE and RoHS directives.
- The label must be heated up for 20 s~40 s and able to endure the high temperature of 260°C. And the color of the material of the nameplate can't change.

6.5 Packing System

HUAWEI LGA module uses five layers ESD pallet, anti-vibration foam and vacuum packing into cartons. To get the details about the packing system, please refer to *HUAWEI LGA Module Process Design Guide.*

7 Certifications

7.1 About This Chapter

This chapter gives a general description of certifications:

- Certifications
- Environmental Protection Certification and Test
- National Compulsory Certification
- GCF and PTCRB

7.2 Certifications

NOTE

The certification of MU739 has not carried out, Table 7-1 shows certifications the MU739 will be implemented. For more demands, please contact us for more details about this information.

Table 7-1 Product Certifications

Certification	Model name
	MU739
CE number	√
FCC number	√
CCC	-
NCC	-
A-TICK	-
Jate & Telec	-
IC number	

Certification	Model name
	MU739
EU RoHS	√
JGPSSI	-
SGS RoHS	-
PVC-Free	-
GCF	√
PTCRB	√

7.3 Environmental Protection Certification and Test

7.3.1 RoHS

RoHS stands for the restriction of the use of certain hazardous substances in electrical and electronic equipment.

The following table lists the substances restricted by the RoHS and upper thresholds of their density.

Restricted Substance	Density Threshold (ppm)
Cadmium (Cd)	100
Lead (Pb)	1000
Mercury (Hg)	1000
Hexavalent chromium (Cr6+)	1000
Polybrominated biphenyls (PBB)	1000
Polybrominated diphenyl ether (PBDE)	1000

Declaration of Conformity (DOC): The product is declared as environment-friendly or as compliant with the environmental protection requirements after internal testing.

7.3.2 WEEE

WEEE stands for the Waste Electrical and Electronic Equipment Directive.

The WEEE mark is on the nameplate of the product. Huawei has concluded recycling agreements with four professional recycling companies in Europe. According to the agreements, the companies are responsible for recycling all Huawei waste equipment in Europe.

The WEEE Directive aims to reduce the amount of electrical and electronic equipment being produced and to encourage everyone to reuse, recycle and recover it.

The rate of recovery reaches 75% by an average weight per product. The reuse and recycling rate of components, materials, and substances reaches 65% by an average weight per product (the additional 10% is for energy recovery). Huawei Technical Support Department also declares the number and weight of the products delivered every year on the European Recycling Platform.

According to the European Recycling Platform and the agreements concluded between Huawei and the recycling companies in EU, the recycling companies specified in the agreements are responsible for recycling the telecommunication products.

7.3.3 PVC-free

PVC-free products are free of polyvinyl chloride **(**PVC) that is harmful to human beings.

PVC is used to produce soft plastic products such as artificial leather, membrane, and cable sheaths, and hard plastic products such as plates, windows, doors, pipes, and valves.

PVC-free test mainly applies to printed circuit boards (PCBs) and surface mount technology (SMT) components.

A notified body must perform PVC-free tests (qualitative analysis and mixed tests) and then issue relevant test reports.

7.3.4 Packaging

The packaging and packaging waste of the product is compliant with 2004/12/EC.

7.4 National Compulsory Certification

7.4.1 Product Certification

Product certification is the process of certifying that a certain product complies with the electromagnetic compatibility (EMC) safety and qualification requirements stipulated in relevant international, national, or industrial regulations and issuing relevant test report and certificate.

7.4.2 Importance of Product Certification

The possible violations of EMC rules are as follows:

- Use certification mark without authorization.
- Supply products without certification mark.
- Supply incompatible products or apply certification mark to incompatible products.
- Make incorrect declarations or no compatibility record is created or kept.

Possible penalties for violation of EMC rules are as follows:

- Sale forbidden
- Inventory seizure
- Compulsory callback
- Fine
- Being accused or put into prison

7.4.3 Product Certification Test Items

A product certification test consists of any or any combination of the following items:

- EMC

  Testing electromagnetic interference (EMI) and electromagnetic sensitivity
- Safety

  Testing the product according to relevant safety regulations and ensuring that the product does no harm to users
- RF

  Measuring whether the radio transmitter meets relevant requirements
- Specific absorption rate (SAR)

  Measuring the RF energy absorbed by the body when an electronic product is used

7.4.4 Product Certification Classifications

Product certification is classified into compulsory certification and non-compulsory certification.

- Compulsory certification

  Many countries and regions define compulsory certification marks to facilitate market supervision of the commodity inspection organizations. For example, the Certification Europe (CE) mark, Federal Communications Commission (FCC) mark in U.S.A, and China Compulsory Certificate (CCC) mark are compulsory certification marks. Only the products with required compulsory certification marks can be sold in the relevant countries or regions.
- Non-compulsory certification

  Non-compulsory certification is also called voluntary certification. Compared with compulsory certification marks, the certification marks issued by independent certification bodies are more common in international trade. The PCS Type Certification Review Board (PTCRB) in America and the Global Certification Forum (GCF) in Europe are two typical examples of non-compulsory certification marks. Non-compulsory certification marks are issued by authorized non-governmental certification bodies based on the product liability laws in relevant countries and are recognized by the local governments. Compared with governmental bodies, non-governmental certification bodies are more professional with better test conditions and more positive certification measures. In addition, non-governmental certification bodies are under supervision of their authorizing administrations. For these reasons, the certification marks issued by non-governmental certification bodies are widely recognized in the market and are essential to international trade.

7.4.5 Certification Modes

- DOC

  By affixing a certification mark to a product, the manufacturer declares that the product is compliant with the relevant certification standards. For example, a manufacturer declares that its product complies with relevant EU directives if it affixes a CE mark to the product.

- NB certification

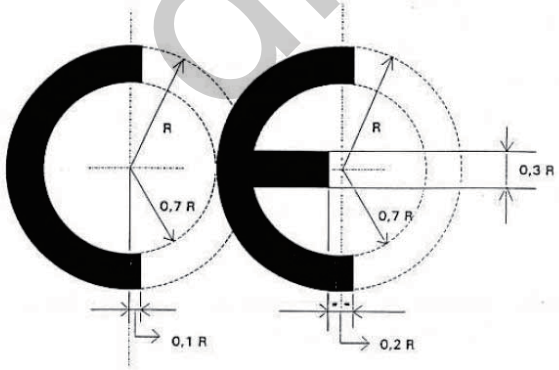
  By affixing a certification mark issued by an authorized certification body to a product, the manufacturer declares that the product passes the NB certification tests and complies with the relevant certification standards. The CE0682 mark issued by CETECOM, the UL mark issued by UL, and the GS mark issued by TUV Rheinland are three examples of NB certification marks.

NB certification is used for Huawei modules in most cases.

7.4.6 Certification Types

CE Certification

According to the R&TTE Directive 1999/95/EC, all wireless equipment and telecommunications terminals sold in EU must meet all the stipulated health, safety, RF, and EMC requirements that provide for CE mark. Wireless equipment using frequency bands whose use is not harmonized throughout the EU should pass the certification test of a notified body. Notification should be given no less than four weeks in advance of the start of placing on the market and should provide information about the radio characteristics of the equipment (in particular frequency bands, channel spacing, type of modulation and RF-power) and the identification number of the notified body. The CE mark is a mandatory European mark. Any product placed on the single market in the European Economic Area should be affixed with a CE mark.



The CE mark of wireless equipment relates to the used frequency bands and the notified body. For this reason, the CE mark on the nameplate consists of letters C and E, the identification number of the notified body, and a symbol.

FCC Certification

FCC stands for Federal Communications Commission.

The FCC, as an independent agency of the United States government, is charged with regulating interstate and international communications by radio, television, wire, satellite and cable.

FCC regulations, as part of federal laws, are divided into several parts.

Different parts define regulations for different products. A product, however, probably is required to meet the regulations in two or more parts.

All terminals should be certified by the FCC or TCB and granted with an FCC ID.

The FCC ID format is as follows: XXXYYYYYYYY

- **XXX** is the identification number of the applicant manufacturer (Huawei: QIS).
- **YYYYYYY** is the product number consisting of two to 14 digits.

An FCCID consists of capital letters in English, digits, and symbols - only. No other character is allowed.

For any Huawei product, the product model is used as the product number. For example, the FCC ID of the EM770W is QISEM770W.

NCC (DGT) Certification

According to *Telecommunications Act* and *Regulations on Inspection and Certification of Controlled Telecommunications Equipment* of Taiwan, no communication and electronic equipment can be manufactured or sold in Taiwan unless certified by the NCC (former DGT) with relevant certification marks.

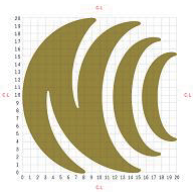
The following lists the controlled telecommunications equipment:

- Radio transmitter
- Radio transceiver
- Radio receiver
- Radiated device
- Other radio sources

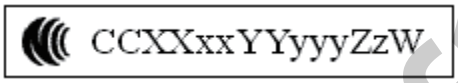
The DGT's *Technical Specifications for Low-Power Radio-Frequency Devices* specifies the frequencies that no low-power RF device or its principal wave should not use and control the radiation field strength of low-power RF devices.

Comply with the following rules when making DGT marks:

- Comply with the *Technical Specifications for Low-Power Radio-Frequency Devices* and the *Compliance Approval Regulations on Controlled Telecommunications Radio-Frequency Devices*.
- Affix or print marks of appropriate size on the equipment bodies because the dimensions are not specified.
- Affix or print the DGT mark on the minimal package if the equipment body is small to the mark.
- Attach the DGT mark to relevant products in compliant with relevant regulations. Ensure that the mark is legible in a single color.



An example of the DGT mark:



A-Tick Certification

The A-Tick is a compliance mark produced by the Australian Communications and Media Authority (ACMA) for telecommunications equipment. The A-Tick indicates that a product is compliant with the mandatory technical and safety standards specified by ACMA and can legally be connected to a telecommunications network in Australia.

All A-Tick certification test items should be performed in local labs in Australia. The test items are as follows:

- Safety test
- EMC test
- SAR test
- RF test

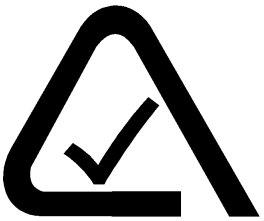
Some test requirements of the A-Tick certification are the same as those of the CE certification. For this reason, CE certification is accepted in Australia to avoid repeated tests.

The following frequency bands are allocated for mobile communication in Australia at present:

- 825–845 MHz and 870–890 MHz: The CDMA digital technical standards of North America are used.
- 890–915 MHz and 935–960 MHz: The GSM digital technical standards of Europe are used.
- 1710–1785 MHz and 1805–1880 MHz: The GSM digital technical standards of Europe are used.

- 1885–1980 MHz and 2110–2170 MHz: The 3G mobile communication technologies are to be used.

The A-tick mark is as follows:



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TELEC and JATE Certification (Japan)

- Telecom Engineer Center (TELEC)

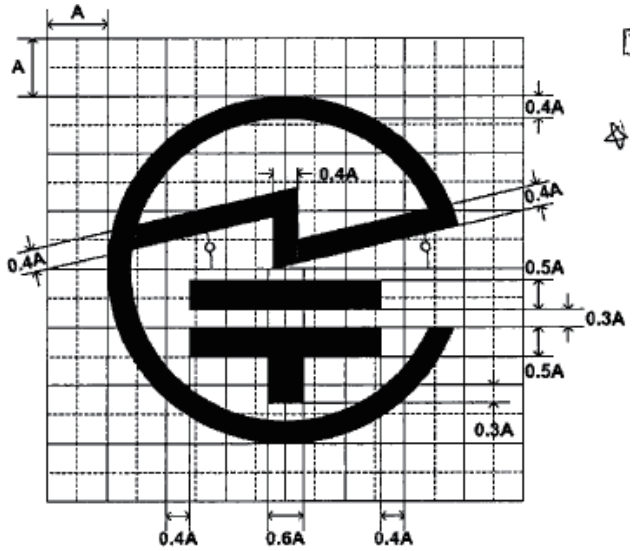
  TELEC is a compulsory certification for radio products in Japan. The TELEC certification complies with Japanese Radio Law. The specific test regulations are stipulated in MIC Notice No.88 and are updated and maintained by the MIC. All wireless products require type approval (mainly for the RF part) by Japan Telecom before entering Japanese market.

- JATE

  JATE certification is mandatory for telecommunications equipment in Japan according to the Telecommunications Business Law. As specified in article 68 in the Telecommunications Business Law enforced in 1985, the Ministry of Public Management, Home Affairs, Posts and Telecommunications (MPHPT) has the right to designate qualified agencies for technical certification.

  The MPHPT designates the Japan Approvals Institute for Telecommunications Equipment (JATE) as the sole authorized agency for technical conditions certification (that is, JATE certification). The JATE provides technical conditions regulatory compliance certifications for telecommunications terminals. The certified equipment can legally be connected to public telecommunications networks without inspection of telecom carriers.

  All products certified by the JATE need to be affixed with certification mark shown in the following figure. Sequence numbers are used on the certification marks.



IC Certification (Canada)

IC stands for Industry Canada. As a department of the Government of Canada, the IC stipulates the inspection standards for analog and digital terminals, performs certifications of electrical and electronic products entering the Canadian market, and requires that all electronic products imported to Canada must pass EMC certification. The involved products include broadcast and TV equipment, IT equipment, wireless equipment, telecommunications equipment, and industrial, scientific, and medical (ISM) equipment. similar to the FCC, the IC applies restrictions on electromagnetic interference only.

The complete IC certification or registration number is as follows:

IC: XXXXXX-YYYYYYYY

- XXXXXX

  XXXXXX is the company number issued by the IC (Huawei: 6369A).
- YYYYYYYY

  YYYYYYYY is the unique product number (UPN) consisting of up to eight capital letters in English and/or digits.

Chinese Certifications

- Network access licensing (NAL)

  The Ministry of Information Industry (MII, former Ministry of Posts and Telecommunications) applies NAL to telecommunications equipment. On January 1, 1999, with the enforcement of the *Administration of the Network Connection of Telecommunications Equipment Procedures* issued by the MII, all telecommunications equipment that access public or private telecommunications networks in China should obtain network access licenses issued by the MII. No telecommunications equipment can be connected to a public telecommunications network or be sold in China without a network access license.

  A network access license includes the following information:

  - License number

- Applicant
- Manufacturer
- Equipment name
- Equipment type
- Place of manufacture
- Remarks
- Date of issue
- Date of expiry

A network access license often is valid for three years. The *Telecommunications Administration Bureau, MII is responsible for inspecting and approving telecommunications equipment and then issuing network access licenses according to the inspection results.* Local telecommunication administration departments are responsible for supervising and managing network access of telecommunications equipment in the local regions.

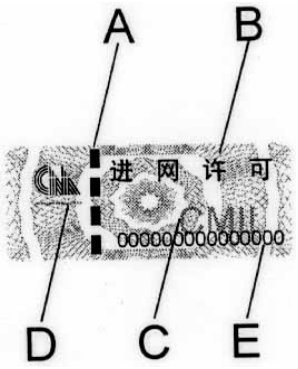
The network access certification is called China Telecommunications Equipment Network Access Approval (TENAA or CTA) or China Telecommunications Equipment Network Access Licensing (NAL).

NAL marks should meet the following requirements:

- NAL marks are the quality compliance marks affixed to the telecommunications equipment that obtains network access licenses.
- NAL marks are printed and issued by the MII.
- NAL marks can be purchased for the equipment that obtains network access licenses.
- NAL marks should be affixed firmly to the telecommunications equipment that obtains network access licenses.
- Forging or illegally using NAL marks is forbidden. No NAL mark can be affixed to the telecommunications equipment that fails to obtain network access licenses or whose network access licenses expire.

The following figure shows an example of NAL marks.

The following figure shows the anti-counterfeiting measures of NAL marks.



- A means the fluorescent anti-counterfeiting string inside the mark. The anti-counterfeiting string is visible under UV light and can be exposed with a knife.
- B means the anti-counterfeiting shading that supports anti-photography and anti-forgery.
- C means the invisible CMII fluorescent mark that is visible under UV light.
- D means the characters that use microform printing.
- E means the unique computer scrambling code that relates to the license number, equipment type, and sequence number. The scrambling code cannot be copied.

- Type approval

  On July 24, 1995, the former State Radio Regulatory Committee (SRRC), the *State Economic and Trade Commission* (SETC), the General Administration of Customs (GAC), and the Ministry of Foreign *Trade* and Economic Cooperation (MFTEC) jointly issued the *Provisions on the Management of Import of Radio Transmission Equipment*. In April 1999, the Ministry of *Industry* and Information Technology of the People's Republic of China (MIIT) issued the *Notice of Strengthening Management of Radio Transmission Equipment*. As stipulated in the provisions and notice, manufacturers of all radio transmission equipment sold in China should possess the *China Radio Transmission Equipment Approval Certificate* issued by the SRRC and the relevant CMIIT ID should be affixed to the equipment nameplates.

  Telecommunication equipment manufacturers should submit the *China Radio Transmission Equipment Approval Certificate* when applying for a network access license to the MIIT. In other words, completion of equipment type approval is one of the prerequisites for network access application.

  The relevant CMIIT ID should be marked on the nameplate of Huawei radio terminals according to article 4 in the *Provisions on Management of Manufacture of Radio Transmission Equipment*.

  The following shows an example of the CMIIT ID:

  xxxxCPxxxx

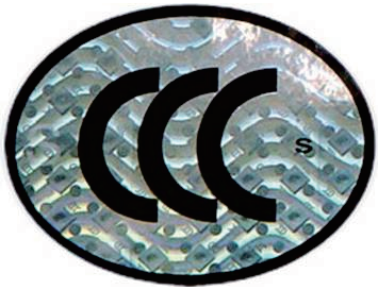
  xxxx before the letters **CP** is four Arabic numerals, indicating the year of issue of the certificate. **xxxx** following the letters **CP** is four Arabic numerals, indicating the sequence number of the certificate.

- CCC

  The China National Certification and Accreditation Administration of People's Republic of China (CNCA) is responsible for managing and organizing the CCC.

The CCC mark is a compulsory safety mark for the products covered in the *List of the First Group of Products Being Required Compulsory Product Certification* when the products are sold on the Chinese market. No listed product can be imported, sold, or used in China without a CCC certificate issued by designated certification bodies or without a CCC mark.

CCC marks are classified into standard and non-standard marks. Huawei products use non-standard CCC marks.



RoHS, REACH, JGPSSI, and Chinese Environmental Protection

- RoHS: the restriction of the use of certain hazardous substances in electrical and electronic equipment

  According to RoHS directive, all electrical and electronic products sold on the EU market should be free of the following six hazardous substances as of July 1, 2006:

  - lead
  - Mercury
  - Cadmium
  - Hexavalent chromium
  - PBB
  - PBDE

  The maximum permitted concentrations of the sixes substances are specified as follows:

  - The maximum permitted concentrations of lead, mercury, hexavalent chromium, PBB, and PBDE are 1000 ppm (0.1%) by weight of homogeneous material.
  - The maximum permitted concentration of cadmium is limited to 100 ppm (0.01%).

The EU does not specify any RoHS mark. Huawei, however, designs the preceding RoHS mark to distinguish between environment-friendly and environment-unfriendly products. For Huawei RoHS marks, any color is acceptable.

- REACH: Regulation (EC) No. 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH)

  The REACH entered into force on June 1, 2007 and was implemented as of June 1, 2008.

  The REACH Regulation is a mandatory preventative regulation on all chemicals sold on the EU market.

  The REACH Regulation creates a large complex chemical management system that transfers the chemicals safety responsibility from the government to the industry. Manufacturers, importers, and downstream users are held responsible for the safety of the chemicals used in their products.

  The REACH Regulation specifies that a substance is regarded as hazardous until proven safe. The earlier EU chemical regulations, however, specifies that a substance is regarded as safe until proven hazardous.

- JGPSSI: Japan Green Procurement Survey Standardization Initiative

  The JGPSSI was established by some Japanese electrical and electronic enterprises in January 2001. Since its establishment, the JGPSSI has been researching on standardization of green procurement of electrical and electronic products. The JGPSSI issued and promoted guidelines for management of chemical substances in products in July 2003.

  The JGPSSI divides the management of chemicals into the following three processes:

  - Acquisition of content information for purchased materials (IN information): Obtain content information (IN information) for each substance/preparation and each article, and confirm the reliability of the content information.
  - Manufacture of products using those materials in a manufacturing process: Increase the reliability in the daily quality management activities, such as preventing the content of incorrect components and preventing contamination by substances/preparations or articles that contain prohibited substances.
  - Provision of content information for the products sold (OUT information): Improve reliability by providing content information (OUT information) for each substance/preparation or article.

- China Environmental protection: *Administrative Measures on the Control of Pollution Caused by Electronic Information Products* that is Similar to EU's RoHS
  - When designing and manufacturing electronic information products, the manufacturers should use materials, technologies, and processes that are easily recyclable and environment-friendly in accordance with the relevant industrial or national standards.
  - All electronic information products sold on Chinese market should be marked with the names and contents of toxic and harmful substances and elements, safety period, and recyclability.
  - The use of six hazardous substances is prohibited or limited in the products listed in the administrative catalogue for the control of pollution caused by electronic information products. The catalogue is not determined at present. It is estimated that the first catalogue is to be issued at the end of year 2009. Printers, telephones, and mobile phones might be listed in the catalogue.

- The control of toxic and harmful substances in electronic information products is covered in the CCC management.
- Six hazardous substances are prohibited, including lead, mercury, cadmium, hexavalent chromium, PBB, and PBDE. Other hazardous substances defined by China are also prohibited.
- No exemption clause is defined in the *Administrative Measures on the Control of Pollution Caused by Electronic Information Products*.

The *Marking for the Control of Pollution Caused by Electronic Information Products* (SJ/T11364-2006) issued on November 6, 2006 specifies that the mark should indicate whether the electronic information products contain any toxic or hazardous substances or elements, the safety period, and the recyclability of the products.

- The mark shown in the left figure is used by the products that are free of any toxic or hazardous substances or elements.
- The mark shown in the right figure is used by products that contain toxic or hazardous substances or elements. The user manuals of the products should indicate the names and contents of the toxic or hazardous substances or elements. The number in the middle of the mark indicates the safety period of the specific product. The safety period of a product will be determined in accordance with the *General Guidelines of Environment-Friendly Use Period of Electronic Information Products* to be issued.

7.4.7 Guide to Product Certification

CE Certification and FCC Certification

Huawei modules pass the RF, EMC, and safety specifications tests and obtain relevant certificates issued by notified certification bodies.

In the case of certification of the laptops installed with Huawei modules, the relevant test reports of Huawei modules can be directly used in accordance with the following rules:

- The conductivity test data in the Huawei RF test report can be directly used by the laptop manufacturer.
- The laptop manufacturer should determine whether the radio test data in Huawei RF test report can be used according to the antenna gain.
  - The radio test data in Huawei RF test report can be directly used if the antenna gain of the laptop is lower than that used in the certification test of Huawei modules.

  - The laptop manufacturer should test antennas of the laptops if the antenna gain of the laptop is higher than that used in the certification test of Huawei modules.
- The laptop manufacturer should test the compliance of the laptops with EMC and safety specifications.
- The SAR of the laptops needs to be tested only if the antennas of the laptops are within 20cm of people.

IC Certification

Huawei applies for IC certificate to the relevant certification bodies by using an IC test report converted from the FCC test report.

NCC Certification

Huawei mails a sample module to the ADT of Taiwan. The ADT then performs relevant tests and issues an NCC certificate.

7.5 GCF and PTCRB

Conformance test and declaration are required for establishing that the GSM and WCDMA terminals to be sold in a region meet the requirements of the local carriers and networks.

Global Certification Forum (GCF) and PTCRB certifications are recognized in most regions all around the world. Most operators all round the world accept either certification as one of the market entry conditions.

7.5.1 GCF Certification

The GCF is an active partnership between European mobile device manufacturers and mobile network operators.

According to the R&TTE Directive 1999/95/EC issued in 2001, authorized test organizations or manufacturers should perform final conformance tests of GSM terminals in compliance with the GCF certification criteria (GCF-CC). Manufacturers then should prepare a DOC and take all responsibilities for quality of the equipment.

The GCF officially launched the 3G WCDMA certification program in February 2005.

The GCF plays an important role in protocol and application conformance testing. The GCF provides harmonized standards for conformance tests and defines a test system approved by all members to ensure that the terminals meet network deployment requirements. All GCF members approve the terminals if the terminals are certified by the GCF. The GCF certifies both test cases and test systems. The GCF certification originates in Europe and now is accepted by mainstream operators in both Europe and Asia.

The GCF certification is a DOC of equipment manufacturers. Equipment manufacturers only need to perform the test items defined by the GCF and then submit a DOC on the GCF website. All GCF members can view the desired DOC on the GCF website.

The test system defined by the GCF requires thorough conformance tests of terminals. The test system consists of indoor and outdoor tests.

- Outdoor tests mean field testing of terminals in actual networks. Outdoor tests are often performed in the networks of large European operators.
- Indoor tests include protocol conformance testing and application conformance testing.
  - Protocol conformance testing aims to test terminals' conformance with 3GPP communication protocols, including GSM and WCDMA protocols.
  - Application conformance testing aims to test terminals' conformance with widely used applications such as browsers, SUPL, MMS, and VT.

    The OMA and the IMTC specify operation and interaction specifications of such upper-layer applications. Application conformance testing is based on the test standards defined by the OMA and the IMTC.

Terminals are not required to pass all the GCF tests. GCF tests are classified into the following types:

- Mandatory tests: Mandatory tests mean the tests that the terminals supporting the GSM or WCDMA system must pass. Mandatory tests cover the capabilities that a terminal must have when it supports communications in the relevant system (GSM or WCDMA).
- Optional tests: Optional tests refer to the tests that the terminals supporting a feature specified in the 3GPP protocol or the OMA or IMTC protocols must pass. If a manufacturer is unwilling to perform such tests for its terminals, the manufacturer should declare that the terminals do not support the related features and not claim that the terminals support the related features when releasing the terminals to the market.
- Unnecessary tests: The GCF does not require the terminals to pass all the tests specified by the 3GPP, OMA, or IMTC. The tests that are not relevant need not to be performed.

As the GCF test items need to be updated frequently to meet the requirements of new communication technologies, the GCF updates the GCF-CC version continuously. Usually the number of test items increases every time a new GCF-CC version is released and terminals are required to pass an increasingly large number of tests.

The current GCF-CC version is 3.35. The GCF updates the GCF-CC version every two or three months. The previous version is rendered obsolete 110 days after a new version is released. All terminal manufacturers need to pay attention to the 110-day rule because additional test items are required after the previous version becomes obsolete. All GCF members can view the latest GCF-CC version, the currently available version, and the validity period published on the GCF website.

7.5.2 PTCRB Certification

The PTCRB requirements are certification standards in North America.

The PTCRB was created in March 1997. GSM 850 MHz requirements were added to the PTCRB requirements in May 2001, which is an important development milestone in the history of standardization organizations in U.S.A. similar to the GCF, the PTCRB comprises of operators and mainstream mobile phone manufacturers, and approved laboratories. The PTCRB was created by North American operators (Cingular, T-Mobile, and Rogers) and is applied to North America, Central America, and South America. The PTCRB certification is similar to the GCF certification, except that the

PTCRB certification acts as the license for the UMTS terminals to be connected to American operators' networks. Only the PTCRB certified terminals are accepted by mainstream operators.

The PTCRB certification also differs from the GCF certification in the frequency bands because the frequency bands used in America differ from those in Europe. The PTCRB focuses on the GSM 850 MHz, GSM 1900 MHz, WCDMA FDD II, and WCDMA FDD V, while the GCF focuses on the GSM 900 MHz, GSM 1800 MHz, and WCDMA FDD I.

Different from the GCF certification, the PTCRB certification does not allow DOC. The entire certification process should be performed under the PTCRB's supervision and all the certification tests should be performed in the labs authorized by the PTCRB. A manufacturer who applies for the PTCRB certification needs to submit a test application to the PTCRB, and then the PTCRB will transfer the application to the test organization designated by the manufacturer. The test organization should perform the test and then submit the test report to the PTCRB for review. The PTCRB certification is completed if the PTCRB approves the test report. The PTCRB should also publish the certification on its website for viewing and querying by the PTCRB members.

The PTCRB certification is similar to the GCF certification in terms of test system. The only difference is that no field testing is performed in the case of the PTCRB certification. OTA tests are adopted to measure the antenna performance. The PTCRB test items and version are also updated continuously. Different from the GCF-CC version, only one PTCRB version is valid at any time. Each PTCRB version is valid for three months. Manufacturers are not allowed to apply for the previous version of PTCRB certification if a new version is released. For a terminal for which the manufacturer has applied for the previous version of PTCRB certification before the new version is released, the manufacturer needs not to apply for the new version if the PTCRB certification is completed within nine months.

7.5.3 Overall-System Certification

Both the test system and test items of the GCF certification are similar to those of the PTCRB certification. Both certifications test the declared capabilities of terminals based on the 3GPP test standards. The integrated equipment needs to pass relevant certification tests, even though the modules pass the conformance certification. The following describes the overall-system certification procedures in detail. The overall-system can be a notebook, a MID, a smartphone, etc.

Overall-System GCF Certification

Huawei modules pass the GCF certification before being released to the market. Huawei performs 2000 to 3000 test items for each type of modules. The major tests are as follows:

- Protocol conformance test
- RF conformance test
- SIM/USIM conformance test

The details about the certification tests are defined in the 3GPP test standards.

According to the GCF-CC, the test reports of modules can be used for the overall-system certification. The changed parts, however, need to be re-tested. Regarding the product structure, the antennas and USIM card interface circuits are

modified in the integrated equipment. For this reason, the antennas and the USIM card interface circuits need to be re-tested in the overall-system certification.

- Field test

  The antenna performance-relevant field test is required due to changes in the antennas and to test the equipment's functions and its interoperability with networks on five networks run by different European operators. To be specific, the field test tests the basic functions of the UE on actual networks and determines whether the UE passes the testing according to the UE performance.

- SIM/USIM test

  USIM card interface circuits are re-designed in the integrated equipment, which may result in changes in the electrical features of the USIM card interface. For this reason, the USIM card interface circuits need to be re-tested. The SIM/USIM test aims to verify the overall performance of SIM/USIM interface with appropriate test instruments in accordance with the relevant 3GPP protocol requirements.

Huawei provides a test report of the product to be certified for the customers who require the GCF certification. The test report is issued by an organization designated for GCF certification. The test report covers the Protocol Implementation Conformance Statement (PICS) and the test information on the product. The PICS is a conformance statement of the product and a basis for GCF certification. The test information includes the performed test items and results of the product. The test organization can issue a certification report of the integrated equipment after performing the required field test and SIM/USIM test based on the test report provided by Huawei.

Terminal manufacturers who apply for the GCF certification of the terminals to be integrated with Huawei modules must accomplish the following tasks:

1. Register as a member of the GCF.

   The GCF certification is a DOC. Only GCF members can submit their DOC on the GCF website. Contact the GCF if you need to join the GCF. Proceed with the following steps if you are a GCF member.

2. Choose a test organization.

   The GCF does not designate its test organizations. All test organizations that meet the GCF test conditions can perform GCF tests. In this case, it is necessary for manufacturers to choose a well-recognized test organization that provides high quality and high efficiency services. The global test organizations 7layers, SGS, and CETCOM are recommended. The recommended test organizations have built various labs all around the world and work closely with the GCF and the PTCRB. Therefore, the test organizations are able to provide high quality and high efficiency test services and are widely recognized by operators.

3. Discuss test details with the test organization.

   Provide the test organization with the test report of Huawei modules and the modifications of the integrated equipment. The test organization then can determine the detailed test items and determine the test schedule accordingly. With the detailed test items and schedule, terminal manufacturers can determine accurate plans of product development and marketing.

4. Perform overall-system certification.

   The integrated equipment can pass the over-all certification test easily if Huawei's design suggestions are complied with.

5. Obtain the test report and the DOC.

The test report describes the details about the overall-system test that operators are concerned about. The GCF certification is completed upon uploading of the DOC to the GCF website.

Overall-System PTCRB Certification

Huawei modules pass the PTCRB certification before being released to the market. Huawei performs 2000 to 3000 test items for each type of modules. The major tests are as follows:

- Protocol conformance test
- RF conformance test
- SIM/USIM conformance test

The details about the certification tests are defined in the 3GPP test standards.

According to the PTCRB certification criteria, the test reports of modules can be used for the overall-system certification. The changed parts, however, need to be re-tested. Regarding the product structure, the antennas and USIM card interface circuits are modified in the integrated equipment. For this reason, the antennas and the USIM card interface circuits need to be re-tested in the overall-system certification.

- OTA test

  Different from the GCF certification, the PTCRB certification does not require field testing. The antenna performance is verified through OTA tests. OTA tests are defined by the CTIA for verifying antenna performance.
- SIM/USIM test

  USIM card interface circuits are re-designed in the integrated equipment, which may result in changes in the electrical features of the USIM card interface. For this reason, the USIM card interface circuits need to be re-tested. The SIM/USIM test aims to verify the overall performance of SIM/USIM interface with appropriate test instruments in accordance with the relevant 3GPP protocol requirements.

Similar to the GCF certification, the PTCRB certification requires a small number of test items for integrated equipment. In addition, the required test items are easy to perform with appropriate design suggestions. Huawei also provides customers with a PTCRB test report of the module. The test is a basis for the PTCRB certification of the equipment integrated with the module.

Terminal manufacturers who apply for the PTCRB certification of the terminals to be integrated with Huawei modules must accomplish the following tasks:

1. Register as a guest of the PTCRB.

   Different from the GCF, the PTCRB comprises of only operators. Terminal manufacturers can join the PTCRB only as guests. The terminal manufacturers who apply for the PTCRB certification have to register as PTCRB guests as they must submit the application on the PTCRB website.
2. Choose a test organization.

   The PTCRB requires only qualified test organization to perform PTCRB tests. In this case, it is necessary for manufacturers to choose a well-recognized test organization that provides high quality and high efficiency services. The global test organizations 7layers, SGS, and CETCOM are recommended. The recommended test organizations have built various labs all around the world and work closely with the GCF and the PTCRB. Therefore, the test organizations are

able to provide high quality and high efficiency test services and are widely recognized by operators.

3. Discuss test details with the test organization.

   Provide the test organization with the test report of Huawei modules and the modifications of the integrated equipment. The test organization then can determine the detailed test items and determine the test schedule accordingly. With the detailed test items and schedule, terminal manufacturers can determine accurate plans of product development and marketing.

4. Submit an overall-system certification application on the PTCRB website and designate a test organization.

   Submit a test application on the PTCRB website, indicating the basic information of the terminal to be certified. The PTCRB then transfers the application to the designated test organization. Remember to pay the CTIA after you submit a test application. Unpaid applications are rejected even though all the required tests are performed.

5. Perform overall-system certification.

   The integrated equipment can pass the over-all certification test easily if Huawei's design suggestions are complied with.

6. Obtain the test report and submit relevant materials.

   The PTCRB test report is provided by the test organization. The terminal manufacturer, however, is required to provide the user manual and other necessary documents of the terminal to be certified on the PTCRB website before the PTCRB test application can be approved. In addition, the PTCRB submits all the materials to the CTIA for review on completion of all the PTCRB tests. The terminal is PTCRB certified on completion of the CTIA review.

GCF and PTCRB Certification

To launch a terminal in the global market, both the GCF certification and the PTCRB certification are required. In this case, the manufacturer does not need to conduct two end-to-end tests. As the USIM test is the same for both the GCF certification and the PTCRB certification, the test organization needs to perform the USIM test only once. This practice is recognized by both the GCF and the PTCRB. The cost, including time and expense, of overall-system certification is thus reduced.

8 Safety Information

Read the safety information carefully to ensure the correct and safe use of your wireless device. Applicable safety information must be observed.

8.1 Interference

Power off your wireless device if using the device is prohibited. Do not use the wireless device when it causes danger or interference with electric devices.

8.2 Medical Device

- Power off your wireless device and follow the rules and regulations set forth by the hospitals and health care facilities.
- Some wireless devices may affect the performance of the hearing aids. For any such problems, consult your service provider.
- Pacemaker manufacturers recommend that a minimum distance of 15 cm be maintained between the wireless device and a pacemaker to prevent potential interference with the pacemaker. If you are using an electronic medical device, consult the doctor or device manufacturer to confirm whether the radio wave affects the operation of this device.

8.3 Area with Inflammables and Explosives

To prevent explosions and fires in areas that are stored with inflammable and explosive devices, power off your wireless device and observe the rules. Areas stored with inflammables and explosives include but are not limited to the following:

- Gas station
- Fuel depot (such as the bunk below the deck of a ship)
- Container/Vehicle for storing or transporting fuels or chemical products
- Area where the air contains chemical substances and particles (such as granule, dust, or metal powder)
- Area indicated with the "Explosives" sign

- Area indicated with the "Power off bi-direction wireless equipment" sign
- Area where you are generally suggested to stop the engine of a vehicle

8.4 Traffic Security

- Observe local laws and regulations while using the wireless device. To prevent accidents, do not use your wireless device while driving.
- RF signals may affect electronic systems of motor vehicles. For more information, consult the vehicle manufacturer.
- In a motor vehicle, do not place the wireless device over the air bag or in the air bag deployment area. Otherwise, the wireless device may hurt you owing to the strong force when the air bag inflates.

8.5 Airline Security

Observe the rules and regulations of airline companies. When boarding or approaching a plane, power off your wireless device. Otherwise, the radio signal of the wireless device may interfere with the plane control signals.

8.6 Safety of Children

Do not allow children to use the wireless device without guidance. Small and sharp components of the wireless device may cause danger to children or cause suffocation if children swallow the components.

8.7 Environment Protection

Observe the local regulations regarding the disposal of your packaging materials, used wireless device and accessories, and promote their recycling.

8.8 WEEE Approval

The wireless device is in compliance with the essential requirements and other relevant provisions of the Waste Electrical and Electronic Equipment Directive 2002/96/EC (WEEE Directive).

8.9 RoHS Approval

The wireless device is in compliance with the restriction of the use of certain hazardous substances in electrical and electronic equipment Directive 2002/95/EC (RoHS Directive).

8.10 Laws and Regulations Observance

Observe laws and regulations when using your wireless device. Respect the privacy and legal rights of the others.

8.11 Care and Maintenance

It is normal that your wireless device gets hot when you use or charge it. Before you clean or maintain the wireless device, stop all applications and power off the wireless device.

- Use your wireless device and accessories with care and in clean environment. Keep the wireless device from a fire or a lit cigarette.
- Protect your wireless device and accessories from water and vapour and keep them dry.
- Do not drop, throw or bend your wireless device.
- Clean your wireless device with a piece of damp and soft antistatic cloth. Do not use any chemical agents (such as alcohol and benzene), chemical detergent, or powder to clean it.
- Do not leave your wireless device and accessories in a place with a considerably low or high temperature.
- Use only accessories of the wireless device approved by the manufacture. Contact the authorized service center for any abnormity of the wireless device or accessories.
- Do not dismantle the wireless device or accessories. Otherwise, the wireless device and accessories are not covered by the warranty.

8.12 Emergency Call

This wireless device functions through receiving and transmitting radio signals. Therefore, the connection cannot be guaranteed in all conditions. In an emergency, you should not rely solely on the wireless device for essential communications.

8.13 Specific Absorption Rate (SAR)

Your wireless device is a radio transmitter and receiver. It is designed not to exceed the limits for exposure to radio waves recommended by international guidelines. These guidelines were developed by the independent scientific organization ICNIRP and include safety margins designed to assure the protection of all persons, regardless of age and health.

The guidelines use a unit of measurement known as the Specific Absorption Rate, or SAR. The SAR limit for wireless devices is 2.0 W/kg and the highest SAR value for this device when tested complied with this limit.

8.14 Regulatory Information

The following approvals and notices apply in specific regions as noted.

8.14.1 CE Approval (European Union)

The wireless device is approved to be used in the member states of the EU. The wireless device is in compliance with the essential requirements and other relevant provisions of the Radio and Telecommunications Terminal Equipment Directive 1999/5/EC (R&TTE Directive).

Federal Communications Commission Notice (United States): Before a wireless device model is available for sale to the public, it must be tested and certified to the FCC that it does not exceed the limit established by the government-adopted requirement for safe exposure.

The SAR limit adopted by the USA and Canada is 1.6 watts/kilogram (W/kg) averaged over one gram of tissue. The highest SAR value reported to the FCC for this device type was compliant with this limit.

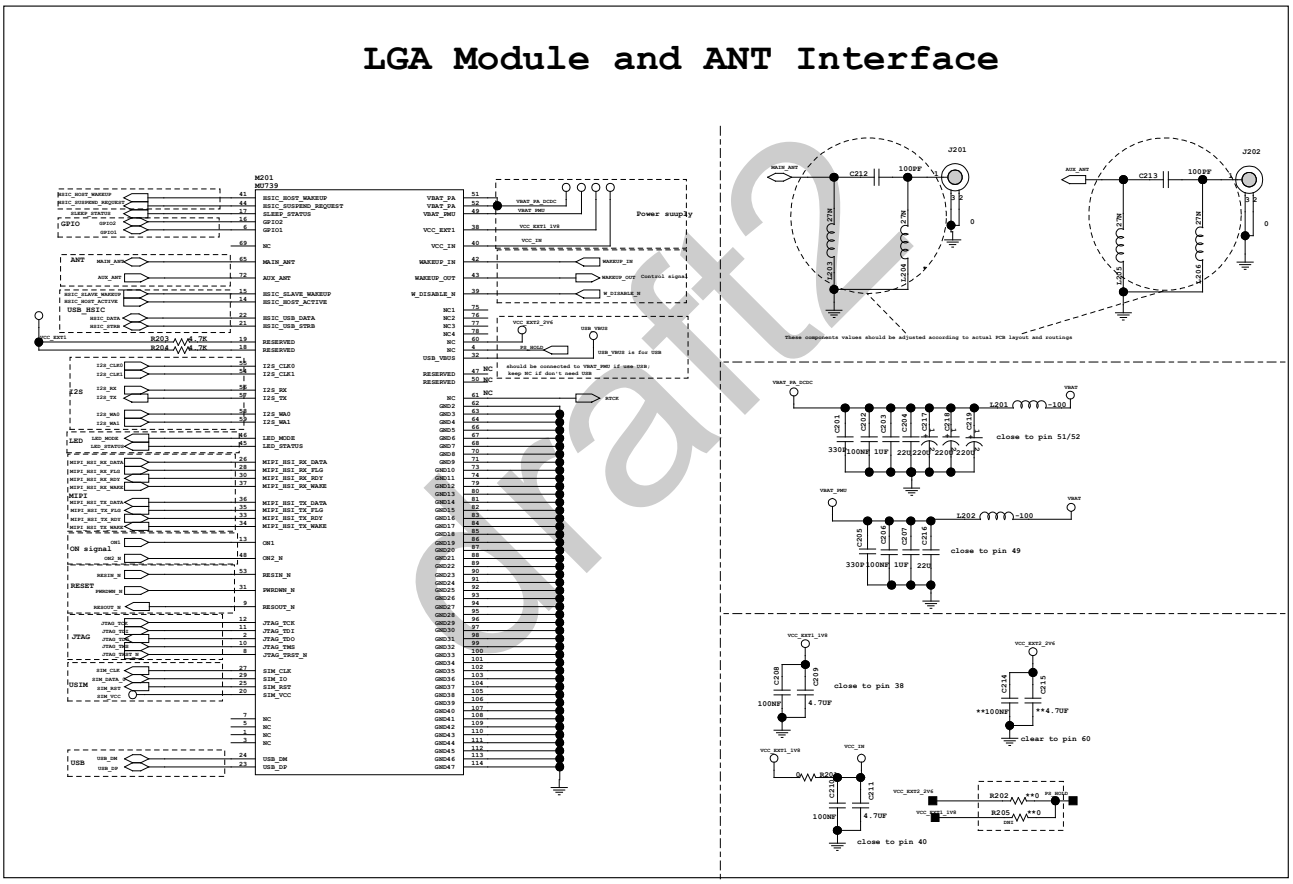
8.14.2 FCC Statement

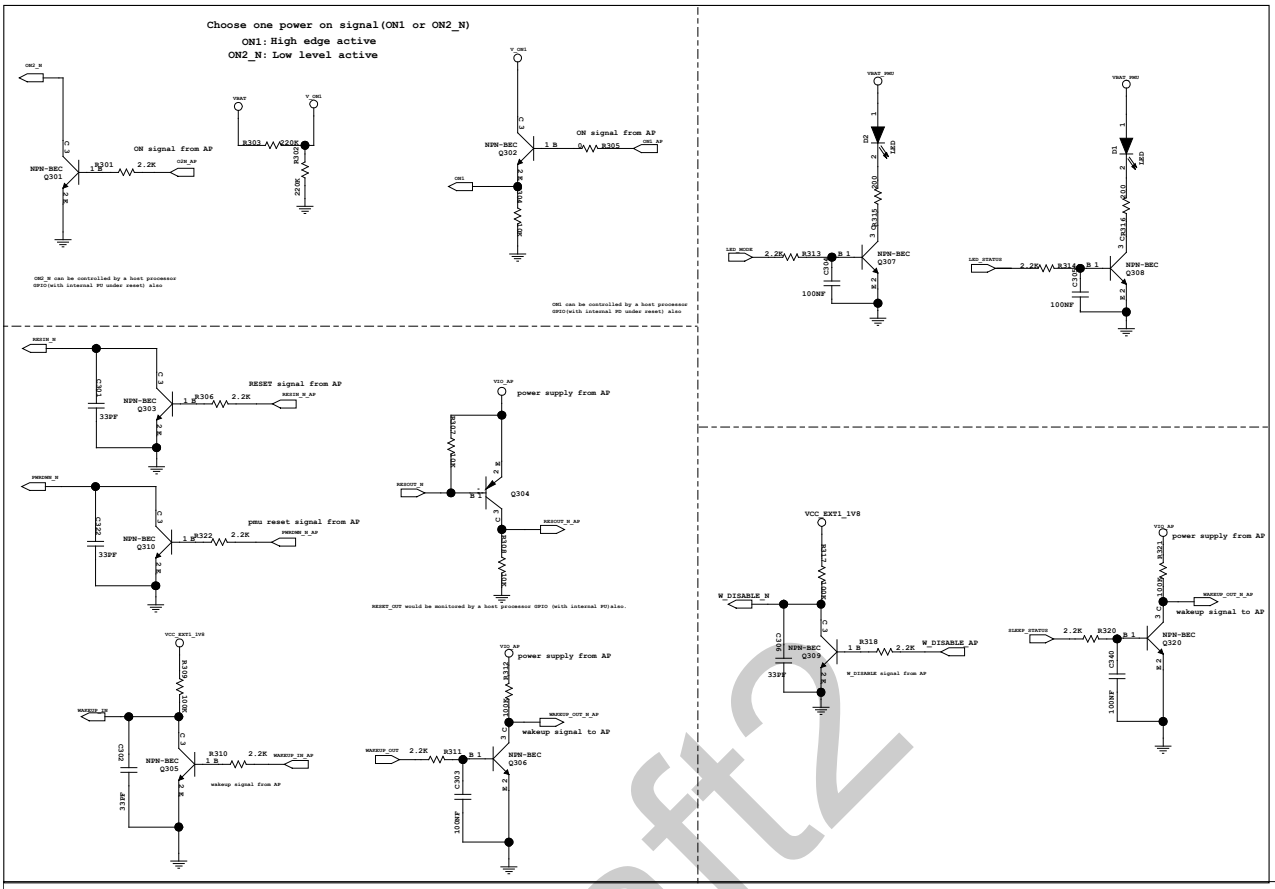
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons.

Warning: Changes or modifications made to this equipment not expressly approved by HUAWEI may void the FCC authorization to operate this equipment

9 Appendix A Circuit of Typical Interface

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ON2_N: Low level active
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RESET signal from AP
power supply from AP
pmu reset signal from AP
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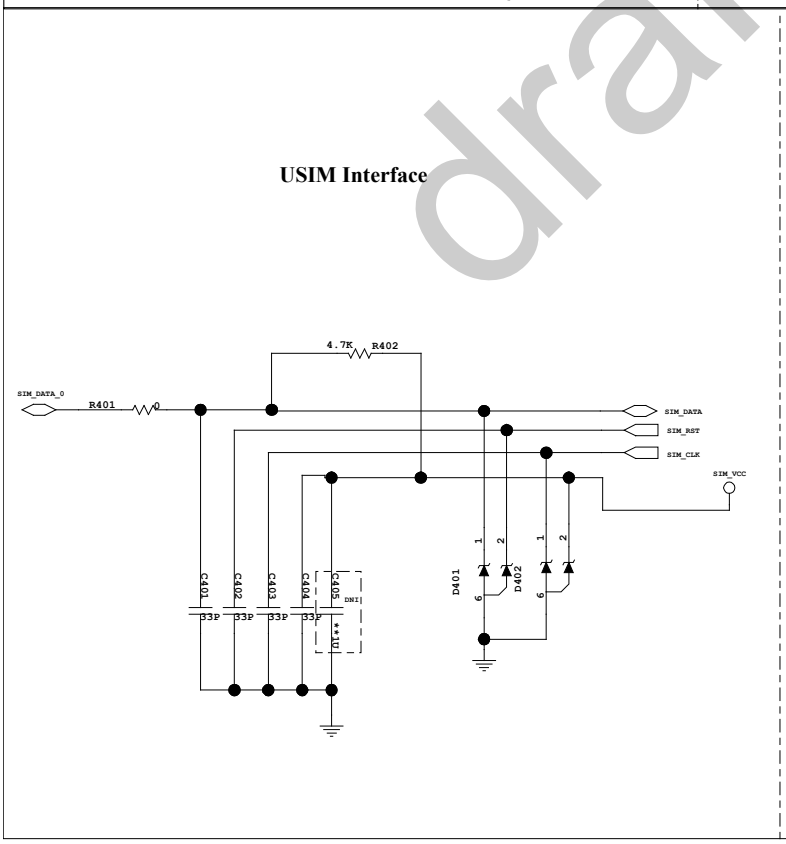
wakeup signal from AP
W_DISABLE signal from AP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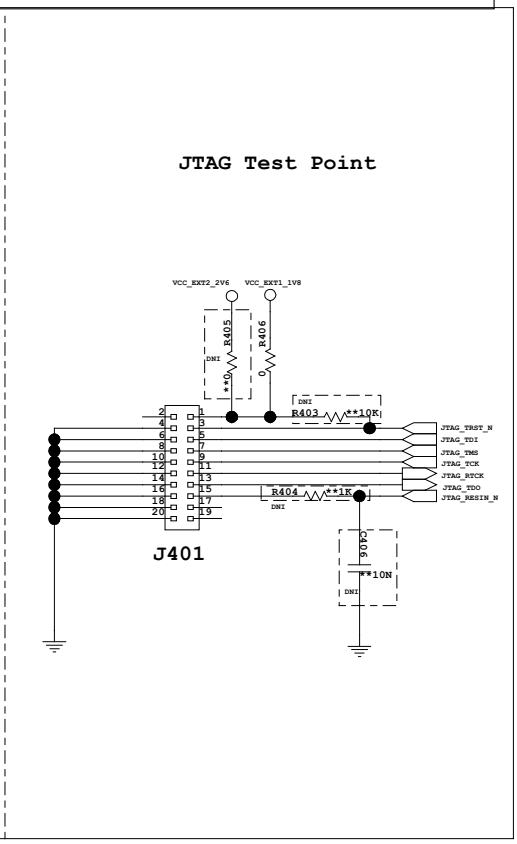
SIM_VCC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J401
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JTAG_TDI
JTAG_TMS
JTAG_TCK
JTAG_RTCK
JTAG_TDO
JTAG_RESIN_N

10 Appendix B Acronyms and Abbreviations

Acronym or Abbreviation	Expansion
CE	European Conformity
CS	Coding Scheme
CSD	Circuit Switched Data
DC	Direct Current
DMA	Direct memory access
EBU	External Bus Unit
EIA	Electronic Industries Association
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
EU	European Union
FCC	Federal Commnications Commission
FDD-TDMA	Frequency Division Duplexing–time Division Multiple Access
GMSK	Gaussian MinimumSshift Keying
GPIO	General-purpose I/O
GPRS	General Packet Radio Service
GSM	Global System for Mobile communication
HSIC	High Speed Inter-Chip Interface
HSDPA	High-Speed Downlink Packet Access
HSPA+	Enhanced High Speed Packet Access
HSUPA	High Speed Up-link Packet Access

Acronym or Abbreviation	Expansion
IPC	Inter Processor Communications
ISO	International Standards Organization
I2S	I2C Sound
LCP	Liquid Crystal Polyester
LDO	Low-Dropout
LED	Light-Emitting Diode
LGA	Land Grid Array
MCP	Multi-chip Package
MIPI	Mobile Industry Processor Interface
NTC	Negative Temperature Coefficient
PA	Power Amplifier
PBCCH	Packet Broadcast Control Channel
PCB	Printed Circuit Board
PDU	Protocol Data Unit
PMU	Power Management Unit
RF	Radio Frequency
RoHS	Restriction of the Use of Certain Hazardous Substances
RTC	Real-time Clock
TTL	Transistor-transistor Logic
TVS	Transient Voltage Suppressor
UMTS	Universal Mobile Telecommunications System
USB	Universal Serial Bus
USIM	Universal Subscriber Identity Module
VSWR	Voltage Standing Wave Ratio
WCDMA	Wideband Code Division Multiple Access