HUAWEI ME309-562 eMTC LGA Module

Hardware Guide

Issue 03

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About This Document

Revision History

Document Version	Date	Chapter	Descriptions
01	2017-03-23	-	Draft release
02	2017-05-26	-	1.Cancel SPI/I2C function; 2.Cancel wake_up out function, use RING to replace it; 3.Update the pin map interface picture because the change above.

Contents

1 Introduction

This document describes the hardware application interfaces and air interfaces provided by HUAWEI ME309-562 eMTC LGA module (hereinafter referred to as the ME309-562 module).

This document helps hardware engineer to understand the interface specifications, electrical features and related product information of the ME309-562 module.

2 Overall Description

2.1 About This Chapter

This chapter gives a general description of the ME309-562 module and provides:

- Function Overview
- Circuit Block Diagram
- Application Block Diagram

2.2 Function Overview

Table 2-1 ME309-562 module features

Feature	Description
Physical Dimensions	• Dimensions (W × L × H): 18 mm × 24 mm × 2.5 mm • Weight TBD
Operating Bands	• HD-FDD LTE: Band 2, Band 4, Band 12, Band13
Operating Temperature	Normal operating temperature: –30°C to +75°C (Characteristics guaranteed) Extended operating temperature[1]: –40°C to +85°C (Normal working)
Storage Temperature	–40°C to +95°C
Power Voltage	3.3 V to 4.2 V (3.8 V is recommended.)

Feature	Description
Application Interface (120-pin LGA interface)	GPIO x 5 UART interface (one 8-wire UART0, two 4-wire UART1&UART2, and UART2 is only for debugging) Standard SIM interface ADC interface x 2 SPI interface (software not support) I2C interface (software not support) LED interface x 2 JTAG interface Power supply interface Power on/off interface Hardware reset interface Wake in/out interface
Antenna Interface	RF antenna pad x 1
Data Services	LTE FDD: DL 300kbps; UL 375kbps @1.4MHz BW catM1

NOTE

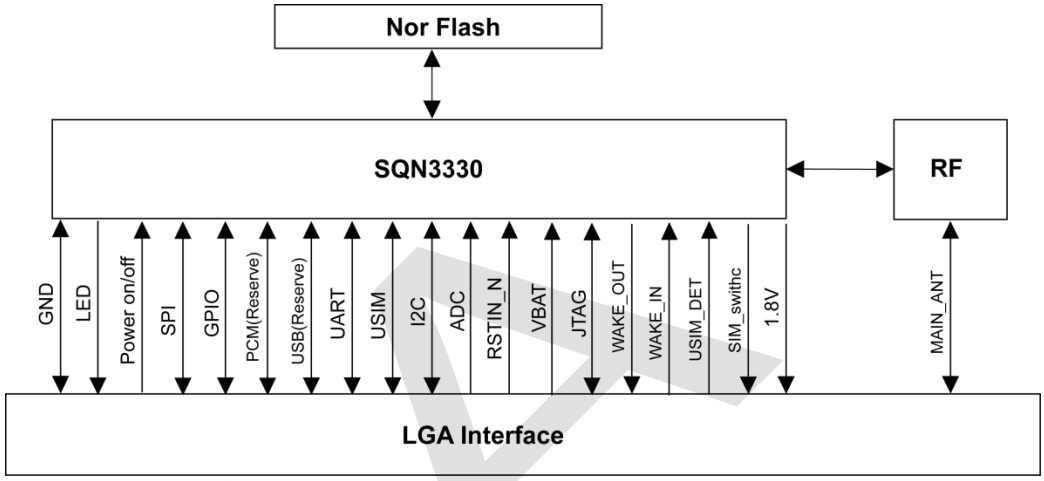
- [1]: When the ME309-562 module works at –40°C to –30°C or +75°C to +85°C, **NOT** all its RF performances comply with the 3GPP specifications.

2.3 Circuit Block Diagram

Figure 2-1 shows the circuit block diagram of the ME309-562 module. The major functional units of the ME309-562 module contain the following parts:

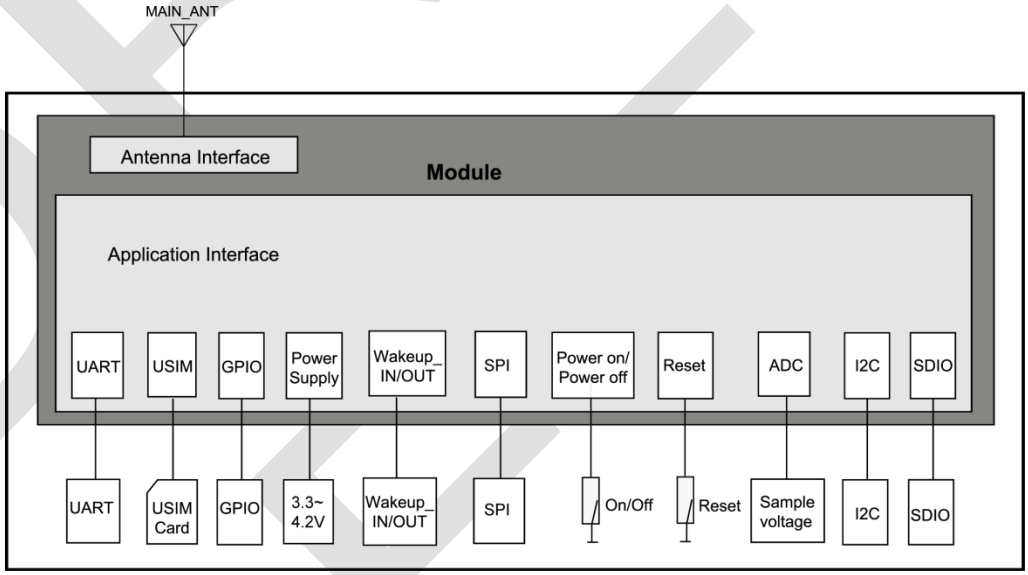
- Baseband controller
- Nor flash
- RF Circuit

Figure 2-1 Circuit block diagram of the ME309-562 module



2.4 Application Block Diagram

Figure 2-2 Application block diagram of the ME309-562 module



UART Interface:	The module supports 3 UART interfaces. Two are 4-wire UARTs, and the other one is 8-wire UART. Uart02 is only for debugging.
SIM Interface:	The SIM interface provides the interface for a SIM card.
GPIO:	General Purpose I/O pins.
External Power Supply:	DC 3.8 V is recommended.
ADC:	Analog-to-Digital Converter
I2C:	Inter－Integrated Circuit

SPI:	Serial Peripheral Interface
RF Pad:	RF antenna interface.

3 Description of the Application Interfaces

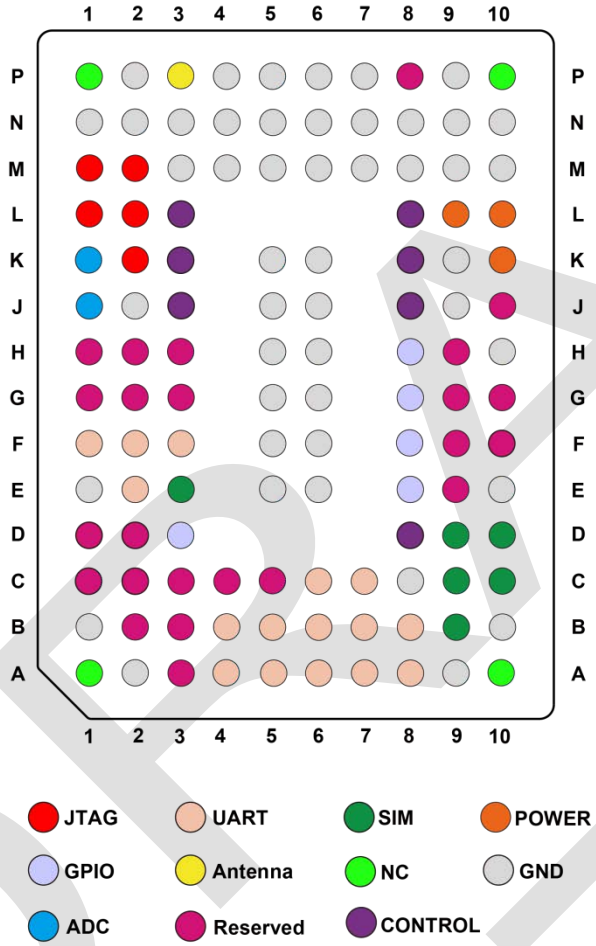
3.1 About This Chapter

This chapter mainly describes the external application interfaces of the ME309-562 module LGA Interface.

3.2 LGA Interface

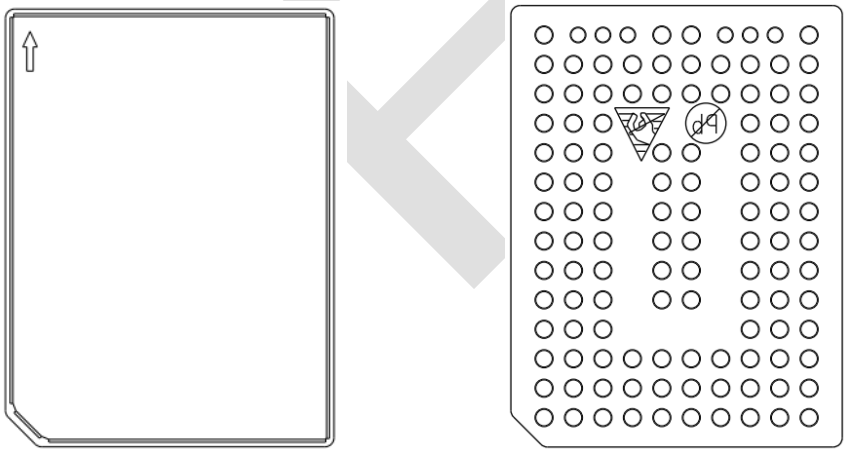
The ME309-562 module uses a 120-pin LGA as its external interface. For details about the module and dimensions, see 4.4 Dimensions.

Figure 3-1 Pin map of LGA interface (**Top view**)



Update 26/05/2017

Figure 3-2 Appearance of ME309-562 module (without label)



Top View

Table 3-1 Definitions of pins on the LGA interface

Pin No.	Pin Name	Pad Type	Description	Parameter	Min. (V)	Typ. (V)	Max. (V)	Comments
A8	UART0_TX	O	UART0 transmit output	V_{OH}	1.44	1.8	1.8	-
				V_{OL}	0	-	0.36	-
A7	UART0_RX	I	UART0 receive data input	V_{IH}	1.26	1.8	1.8	-
				V_{IL}	0	-	0.54	-
B7	UART0_CTS	I	UART0 clear to send	V_{IH}	1.26	1.8	1.8	-
				V_{IL}	0	-	0.54	-
B8	UART0_RTS	O	UART0 ready for receive	V_{OH}	1.44	1.8	1.8	-
				V_{OL}	0	-	0.36	-
C7	UART0_DTR	I	Data terminal ready	V_{IH}	1.26	1.8	1.8	-
				V_{IL}	0	-	0.54	-
C6	UART0_DSR	O	UART0 data set ready	V_{OH}	1.44	1.8	1.8	-
				V_{OL}	0	-	0.36	-
B6	UART0_DCD	O	UART0 data carrier detect	V_{OH}	1.44	1.8	1.8	-
				V_{OL}	0	-	0.36	-
A6	UART0_RING	O	UART0 ring indicator	V_{OH}	1.44	1.8	1.8	Use as wake_up out
				V_{OL}	0	-	0.36	
A4	UART1_TX	O	UART1 transmit output	V_{OH}	1.44	1.8	1.8	-
				V_{OL}	0	-	0.36	-
A5	UART1_RX	I	UART1 receive data input	V_{IH}	1.26	1.8	1.8	-
				V_{IL}	0	-	0.54	-
B4	UART1_CTS	I	UART1 clear to send	V_{IH}	1.26	1.8	1.8	-
				V_{IL}	0	-	0.54	-
B5	UART1_RTS	O	UART1 ready for receive	V_{OH}	1.44	1.8	1.8	-
				V_{OL}	0	-	0.36	-
F3	UART2_TX	O	UART2 transmit output	V_{OH}	1.44	1.8	1.8	-
				V_{OL}	0	-	0.36	-
F1	UART2_RX	I	UART2 receive data input	V_{IH}	1.26	1.8	1.8	-
				V_{IL}	0	-	0.54	-

Pin No.	Pin Name	Pad Type	Description	Parameter	Min. (V)	Typ. (V)	Max. (V)	Comments
F2	UART2_CTS	I	UART2 clear to send	V_{IH}	1.26	1.8	1.8	-
				V_{IL}	0	-	0.54	-
E2	UART2_RTS	O	UART2 ready for receive	V_{OH}	1.44	1.8	1.8	-
				V_{OL}	0	-	0.36	-
D1	SPI_CS_N	O	Active low chip select to SPI device	V_{OH}	1.44	1.8	1.8	NOT support
				V_{OL}	0	-	0.36	
D2	SPI_CLK	O	Clock to SPI device, running at 104MHz	V_{OH}	1.44	1.8	1.8	NOT support
				V_{OL}	0	-	0.36	
C2	SPI_MOSI	O	Serial data line for transmitted data, master out	V_{OH}	1.44	1.8	1.8	NOT support
				V_{OL}	0	-	0.36	
C1	SPI_MISO	I	Serial data line for received data, master in	V_{IH}	1.26	1.8	1.8	NOT support
				V_{IL}	0	-	0.54	
G1	I2C_SCL	O	I2C bus serial clock line (need pull up to VCC_EXT)	V_{OH}	1.44	1.8	1.8	NOT support
				V_{OL}	0	-	0.36	
H1	I2C_SDA	I/O	I2C bus serial data line (need pull up to VCC_EXT)	V_{OH}	1.44	1.8	1.8	NOT support
				V_{OL}	0	-	0.36	
				V_{IH}	1.26	1.8	1.8	
				V_{IL}	0	-	0.54	
D9	SIM_VCC	PO	Power supply for SIM	-	-	1.8/ 3.0	-	-
D10	SIM_IO	I/O	SIM data	-	-	1.8/ 3.0	-	-
B9	SIM_CLK	O	SIM clock	-	-	1.8/ 3.0	-	-
C9	SIM_RST	O	SIM reset	-	-	1.8/ 3.0	-	-
C10	SIM_DETECT	I	SIM hot swap	V_{IH}	1.26	1.8	1.8	If not use, please pull it

Pin No.	Pin Name	Pad Type	Description	Parameter	Min. (V)	Typ. (V)	Max. (V)	Comments
			detection H: SIM is resent L: SIM is absent	V_{IL}	0	-	0.54	high to VCC_EXT on your board.
E3	SIM_SWITCH	O	Switch from one card to the other, should cooperate with SIM switch IC chip.	V_{OH}	1.44	1.8	1.8	If not use, please leave it open.
				V_{OL}	0	-	0.36	
L8	WAKEUP_IN	I	The host sets the module into sleep mode or wakes up the module from sleep mode. H: Sleep mode is disabled. L: Sleep mode is enabled. (default L)	V_{IH}	1.26	1.8	1.8	-
				V_{IL}	0	-	0.54	-
L3	WAKEUP_OUT	O	Module wakes up the host	V_{OH}	1.44	1.8	1.8	NOT support, please use RING as wake_up out
				V_{OL}	0	-	0.36	
K3	SLEEP_STATUS	O	Sleep status indicator H: The module is in wakeup state. L: The module is in sleep state.	V_{OH}	1.44	1.8	1.8	-
				V_{OL}	0	-	0.36	-
J8	LED_MODE	O	Network mode indicator.	V_{OH}	1.44	1.8	1.8	-
				V_{OL}	0	-	0.36	-
E8	GPIO1	I/O	General Purpose I/O pins.	V_{OH}	1.44	1.8	1.8	Default configuration is input pull down.
				V_{OL}	0	-	0.36	
				V_{IH}	V_{IH}	1.26	1.8	
				V_{IL}	V_{IL}	0	-	
G8	GPIO2	I/O	General Purpose I/O	V_{OH}	1.44	1.8	1.8	Default configuration is input pull
				V_{OL}	0	-	0.36	

Pin No.	Pin Name	Pad Type	Description	Parameter	Min. (V)	Typ. (V)	Max. (V)	Comments
			pins.	V_{IH}	V_{IH}	1.26	1.8	down.
				V_{IL}	V_{IL}	0	-	
D3	GPIO3	I/O	General Purpose I/O pins.	V_{OH}	1.44	1.8	1.8	Default configuration is input pull down.
				V_{OL}	0	-	0.36	
				V_{IH}	V_{IH}	1.26	1.8	
				V_{IL}	V_{IL}	0	-	
F8	GPIO4	I/O	General Purpose I/O pins.	V_{OH}	1.44	1.8	1.8	Default configuration is input pull down.
				V_{OL}	0	-	0.36	
				V_{IH}	V_{IH}	1.26	1.8	
				V_{IL}	V_{IL}	0	-	
H8	GPIO5	I/O	General Purpose I/O pins.	V_{OH}	1.44	1.8	1.8	Default configuration is input pull down.
				V_{OL}	0	-	0.36	
				V_{IH}	V_{IH}	1.26	1.8	
				V_{IL}	V_{IL}	0	-	
L2	JTAG_TMS	I	JTAG test mode select	V_{IH}	1.26	1.8	1.8	-
				V_{IL}	0	-	0.54	-
M2	JTAG_TRST_N	I	JTAG test reset	V_{IH}	1.26	1.8	1.8	-
				V_{IL}	0	-	0.54	-
K2	JTAG_TCK	I	JTAG test clock	V_{IH}	1.26	1.8	1.8	-
				V_{IL}	0	-	0.54	-
L1	JTAG_TDO	O	JTAG test data output	V_{OH}	1.44	1.8	1.8	-
				V_{OL}	0	-	0.36	-
M1	JTAG_TDI	I	JTAG test serial data input	V_{IH}	1.26	1.8	1.8	-
				V_{IL}	0	-	0.54	-
K1	ADC_1	AI	Conversion interface for analog signals to digital signals	-	-0.036	-	1.836	The ADC's resolution is 10bit
J1	ADC_2	AI	Conversion interface for analog signals to digital signals	-	-0.036	-	1.836	

Pin No.	Pin Name	Pad Type	Description	Parameter	Min. (V)	Typ. (V)	Max. (V)	Comments
D8	POWER_ON	I	System power - on	-	-	1.8	-	Not support, will cancel it
J3	POWER_OFF	I	System power - off	-	-	1.8	-	Not support, will cancel it
F9	RESIN_N	I	System reset, active low.	-	-	1.8	-	Please add a pull-high resister to 1.8V on your board (not VCC_EXT).
K8	BOOT_MODE	I	Boot mode configure H: boot from flash L: boot from host	V_{IH}	1.26	1.8	1.8	Please design a pull-high resister to VCC_EXT and a pull down resister to Ground on your board, default pull high resister is on the PCB board.
				V_{IL}	0	-	0.54	
K10	VCC_EXT	PO	Pin for external power output	-	1.71	1.8	1.89	Max current is 10mA
L9	VCC_Module	PI	Power supply Input	-	3.3	3.8	4.2	Max current is about 300mA
L10	VCC_Module	PI	Power supply input	-	3.3	3.8	4.2	
P3	RF_ANT	RF	RF pin of module	-	-	-	-	-
A3	Reserved	-	Reserved, please keep this pin open.	-	-	-	-	-
B2	Reserved	-	Reserved, please keep this pin open.	-	-	-	-	-
B3	Reserved	-	Reserved, please keep this pin open.	-	-	-	-	-
C3	Reserved	-	Reserved, please keep this pin open.	-	-	-	-	-

Pin No.	Pin Name	Pad Type	Description	Parameter	Min. (V)	Typ. (V)	Max. (V)	Comments
G9	Reserved	-	Reserved, please keep this pin open.	-	-	-	-	-
G10	Reserved	-	Reserved, please keep this pin open.	-	-	-	-	-
F10	Reserved	-	Reserved, please keep this pin open.	-	-	-	-	-
E9	Reserved	-	Reserved, please keep this pin open.	-	-	-	-	-
J10	Reserved	-	Reserved, please keep this pin open.	-	-	-	-	-
H9	Reserved	-	Reserved, please keep this pin open.	-	-	-	-	-
C5	Reserved	-	Reserved, please keep this pin open.	-	-	-	-	-
G2	Reserved	-	Reserved, please keep this pin open.	-	-	-	-	-
G3	Reserved	-	Reserved, please keep this pin open.	-	-	-	-	-
H2	Reserved	-	Reserved, please keep this pin open.	-	-	-	-	-
H3	Reserved	-	Reserved, please keep this pin open.	-	-	-	-	-
P8	Reserved	-	Reserved, please keep this pin open.	-	-	-	-	-
C4	Reserved	-	Reserved, please keep this pin open.	-	-	-	-	-
A1	NC	-	Not connected	-	-	-	-	-

Pin No.	Pin Name	Pad Type	Description	Parameter	Min. (V)	Typ. (V)	Max. (V)	Comments
A10	NC	-	Not connected	-	-	-	-	-
P1	NC	-	Not connected	-	-	-	-	-
P10	NC	-	Not connected	-	-	-	-	-
A2	GND	-	Ground	-	-	-	-	-
A9	GND	-	Ground	-	-	-	-	-
B1	GND	-	Ground	-	-	-	-	-
B10	GND	-	Ground	-	-	-	-	-
C8	GND	-	Ground	-	-	-	-	-
E1	GND	-	Ground	-	-	-	-	-
E5	GND	-	Ground	-	-	-	-	-
E6	GND	-	Ground	-	-	-	-	-
E10	GND	-	Ground	-	-	-	-	-
F5	GND	-	Ground	-	-	-	-	-
F6	GND	-	Ground	-	-	-	-	-
G5	GND	-	Ground	-	-	-	-	-
G6	GND	-	Ground	-	-	-	-	-
H5	GND	-	Ground	-	-	-	-	-
H6	GND	-	Ground	-	-	-	-	-
H10	GND	-	Ground	-	-	-	-	-
J2	GND	-	Ground	-	-	-	-	-
J5	GND	-	Ground	-	-	-	-	-
J6	GND	-	Ground	-	-	-	-	-
J9	GND	-	Ground	-	-	-	-	-
K5	GND	-	Ground	-	-	-	-	-
K6	GND	-	Ground	-	-	-	-	-
K9	GND	-	Ground	-	-	-	-	-
M3	GND	-	Ground	-	-	-	-	-
M4	GND	-	Ground	-	-	-	-	-
M5	GND	-	Ground	-	-	-	-	-
M6	GND	-	Ground	-	-	-	-	-

Pin No.	Pin Name	Pad Type	Description	Parameter	Min. (V)	Typ. (V)	Max. (V)	Comments
M7	GND	-	Ground	-	-	-	-	-
M8	GND	-	Ground	-	-	-	-	-
M9	GND	-	Ground	-	-	-	-	-
M10	GND	-	Ground	-	-	-	-	-
N1	GND	-	Ground	-	-	-	-	-
N2	GND	-	Ground	-	-	-	-	-
N3	GND	-	Ground	-	-	-	-	-
N4	GND	-	Ground	-	-	-	-	-
N5	GND	-	Ground	-	-	-	-	-
N6	GND	-	Ground	-	-	-	-	-
N7	GND	-	Ground	-	-	-	-	-
N8	GND	-	Ground	-	-	-	-	-
N9	GND	-	Ground	-	-	-	-	-
N10	GND	-	Ground	-	-	-	-	-
P2	GND	-	Ground	-	-	-	-	-
P4	GND	-	Ground	-	-	-	-	-
P5	GND	-	Ground	-	-	-	-	-
P6	GND	-	Ground	-	-	-	-	-
P7	GND	-	Ground	-	-	-	-	-
P9	GND	-	Ground	-	-	-	-	-

NOTE

- **I** indicates pins for digital signal input; **O** indicates pins for digital signal output; **AI** indicates pins for analog signal input; **PI** indicates power input pins; **PO** indicates power output pins; **P** indicates power pins.
- V_{IL} indicates low-level input voltage; V_{IH} indicates high-level input voltage; V_{OL} indicates low-level output voltage; V_{OH} indicates high-level output voltage.
- The **NC** (Not Connected) pins are floating and there are no signal connected to these pins.
- The **Reserved** pins are internally connected to the module. Therefore, these pins should not be used, otherwise they may cause problems. Please contact with us for more details about this information.

4 Mechanical Specifications

4.1 About This Chapter

- Storage Requirement
- Moisture Sensitivity
- Dimensions
- Customer PCB Design

4.2 Storage Requirement

The module must be stored and sealed properly in vacuum package under a temperature below 40°C and the relative humidity less than 90% in order to ensure the weldability within 12 months.

4.3 Moisture Sensitivity

- The moisture sensitivity is level 3.
- After unpacking, the module must be assembled within 168 hours under the environmental conditions that the temperature is lower than 30°C and the relative humidity is less than 60%. If the preceding conditions cannot be met, the module needs to be baked according to the parameters specified in Table 4-1 .

Table 4-1 Baking parameters

Baking Temperature	Baking Condition	Baking Duration	Remarks
125°C±5°C	Relative humidity ≤ 60%	8 hours	Refer to JESD-033C in detail

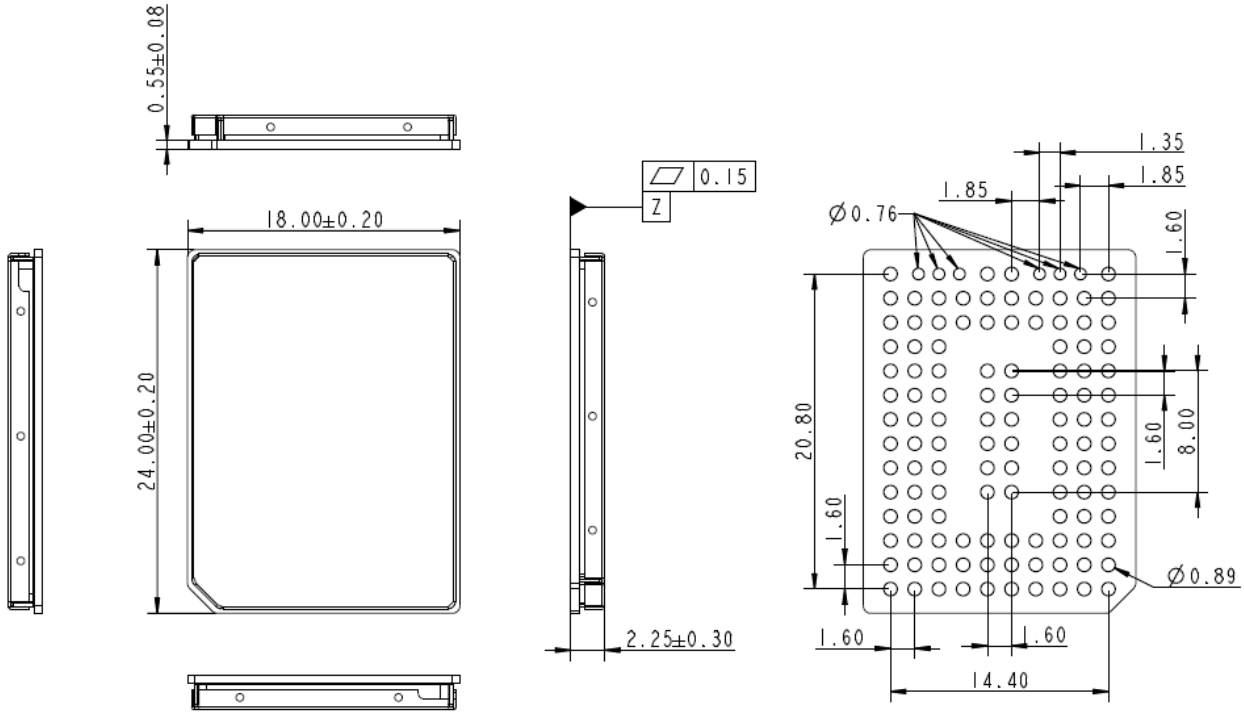
NOTE

Moving, storing, and processing the product must comply with IPC/JEDEC J-STD-033.

4.4 Dimensions

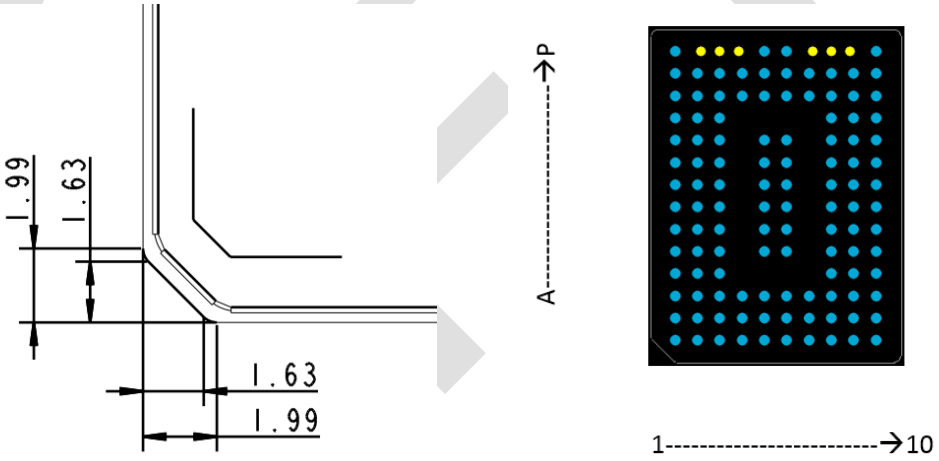
Figure 4-1 shows the dimensions of the ME309-562 module in details.

Figure 4-1 Dimensions (Unit: mm)



The detail information about the corner and the module pin description top view:

1. the yellow pins, diameter is 0.76 mm, pitch is 1.35 mm,
2. the blue pins, diameter is 0.89 mm, pitch is 1.60 mm.



4.5 Customer PCB Design

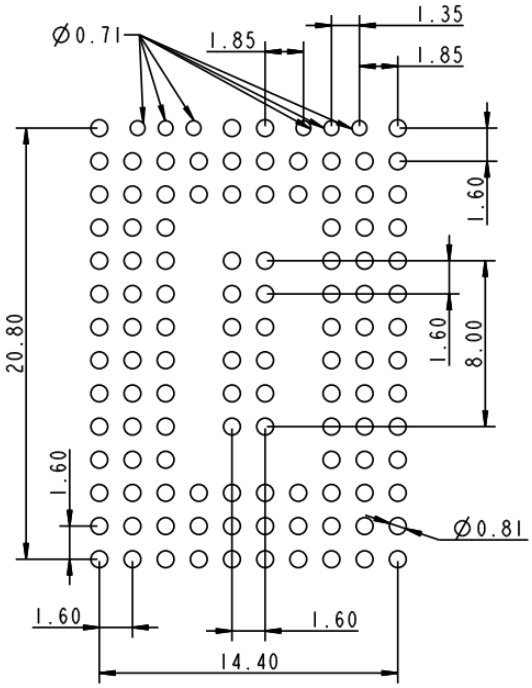
4.5.1 PCB Surface Finish

The PCB surface finish recommended is Electroless Nickel Immersion Gold (ENIG). Organic Solderability Preservative (OSP) may also be used, ENIG preferred.

4.5.2 PCB Pad Design

To achieve assembly yields and solder joints of high reliability, it is recommended that the PCB pad size be designed as follows:

Figure 4-2 Footprint design of customer's PCB (Unit: mm)



Some detail information about the **recommend module footprint**:

1. the yellow pins, diameter is 0.71 mm, pitch is 1.35 mm,
2. the blue pins, diameter is 0.81 mm, pitch is 1.60 mm.

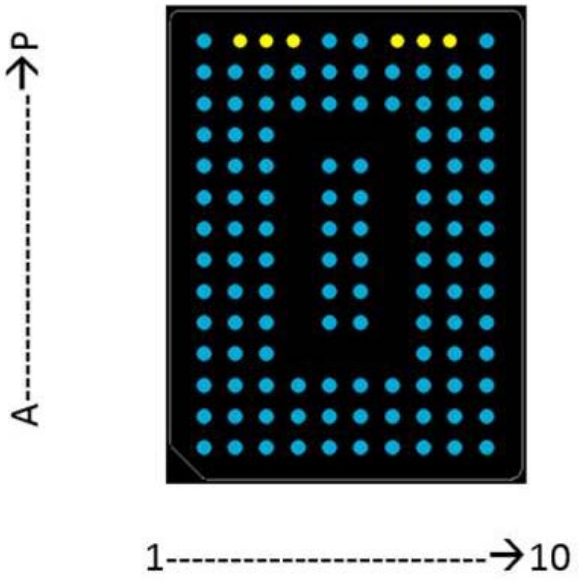


Figure 4-3 Detail information about the recommend module footprint

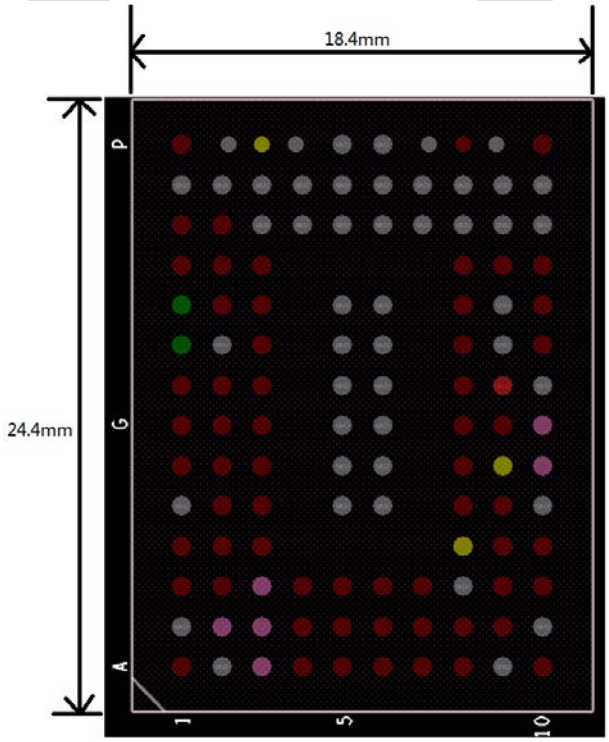


Figure 4-4 Recommended Package Size on HUAWEI motherboard (Unit: mm)

4.5.3 Solder Mask

Non Solder Mask Defined (NSMD) is recommended. In addition, the solder mask of the NSMD pad design is larger than the pad so the reliability of the solder joint can be improved.

The solder mask must be 100 µm–150 µm larger than the pad, that is, the single side of the solder mask must be 50 µm–75 µm larger than the pad. The specific size depends on the processing capability of the PCB manufacturer.

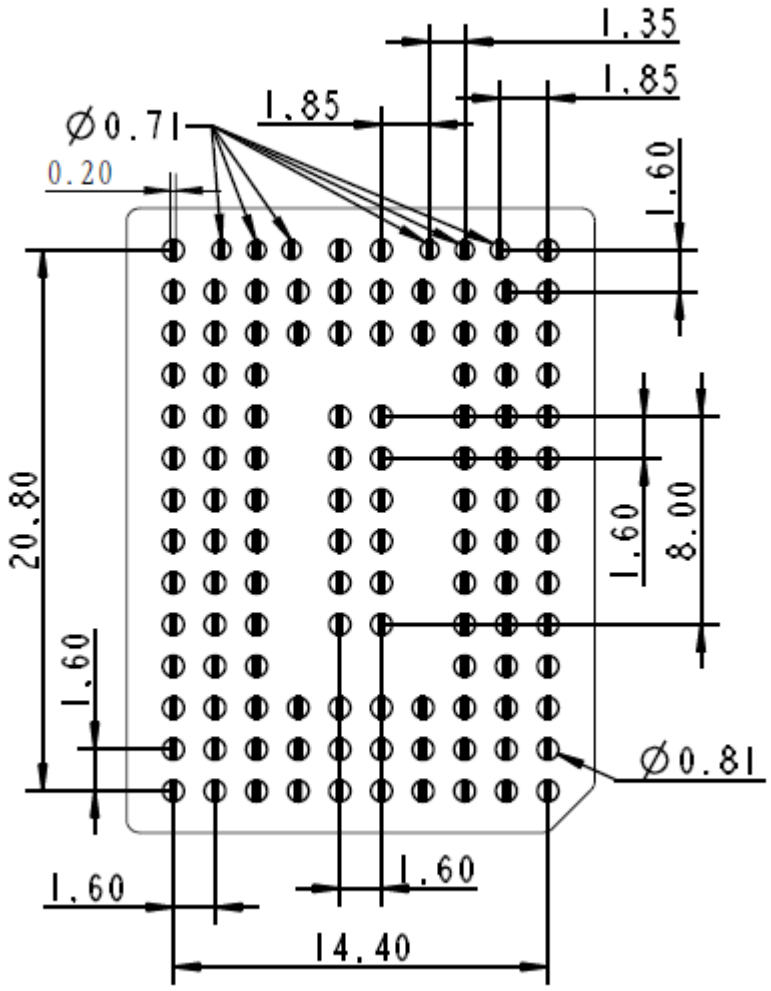
4.5.4 Requirements on PCB Layout

- To reduce deformation, a thickness of at least 1.0 mm is recommended.
- Other devices must be located more than 3 mm (5 mm recommended) away from the two parallel sides of the LGA module (rework requirement),and other sides with 0.6 mm. The minimum distance between the LGA module and the PCB edge is 0.3 mm.
- When the PCB layout is double sided, the LGA module must be placed on the second side for assembly; so as to avoid module dropped from PCB or component (located in module) re-melding defects caused by uneven weight.
- Customers PCB together with ME309-562 should be placed in an enclosed box to reduce the impact of high humidity as far as possible.
- The bottom of the module is not allowed to put non-ground line or non-ground hole. If the design can not be achieved, then the non-gound line and hole must be covered by green oil.

4.5.5 Stencil Design

It is recommended that the stencil for the LGA module be 0.15 mm in thickness. The stencil design is shown as Figure 4-5 :

Figure 4-5 Recommended stencil design of LGA module (Unit: mm)



NOTE

The stencil design has been qualified for HUAWEI motherboard assembly, customers can adjust the parameters by their motherboard design and process situation to assure LGA soldering quality and no defect.