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ME3630

HARDWARE DEVELOPMENT GUIDE

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LTE Module Series

ZTE

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REVISION HISTORY

Version	Date	Description
1.0	2016-02-26	1st released version

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About This Document

A. Application Range

This document is the Product Technical Specification for the ME3630 GSM/CDMA/WCDMA/ TD-SCDMA/LTE TDD/LTE FDD module. It defines the high level product features and illustrates the interface for these features. This document is intended to cover the hardware aspects of the product, including electrical and mechanical.

B. Reading Note

The symbols below are the reading notes you should pay attention on:

: Warning or Attention

: Note or Remark

C. Purpose

This document provides the hardware solutions and development fundamentals for a product with the module. By reading this document, the user can have an overall knowledge of the module and a clear understanding of the technical parameters. With this document, the user can successfully fulfill the application and development of wireless Internet product or equipment.

Besides the product features and technical parameters, this document also provides the product reliability tests and related testing standards, RF performance indexes and a guide on the design of user circuits, to provide the user with a complete design reference.

NOTE: To ensure the module manufacturing and welding quality, do as the chapter 7 of Manufacturing Guide in this document. The force on the squeegee should be adjusted so as to produce a clean stencil surface on a single pass and ensure the module soldering quality.

D. Abbreviations

Table below is a list of abbreviations involved in this document, as well as the English full names.

Abbreviations	Full Name
3GPP	Third Generation Partnership Project
AP	Another name of DTE
CHAP	Challenge Handshake Authentication Protocol
CE	European Conformity
CMOS	Complementary Metal Oxide Semiconductor
DCE	Data Communication Equipment
DL	Downlink
DTE	Data Terminal Equipment
EIA	Electronic Industries Association
EMC	Electromagnetic Compatibility
ESD	Electro-Static discharge
ESR	Equivalent Series Resistance
FDD	Frequency Division Duplex
GPIO	General-purpose I/O
LCC	Leadless Chip Carrier

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LDO	Low-Dropout
LED	Light Emitting Diode
LTE	Long Term Evolution
ME	Mobile Equipment
MO	Mobile Origination Call
MT	Mobile Termination Call
MSB	Most Significant Bit
PC	Personal Computer
PCB	Printed Circuit Board
PDA	Personal Digital Assistant
PDU	Protocol Data Unit
PAP	Password Authentication Protocol
PPP	Point to Point Protocol
RTC	Real Time Clock
SMS	Short Messaging Service
SMT	Surface Mount Technology
SPI	Serial Peripheral Interface
TBD	To Be Determined
TCP	Transmission Control Protocol
TIS	Total Isotropic Sensitivity
TRP	Total Radiated Power
TVS	Transient Voltage Suppressor
UART	Universal Asynchronous Receiver-Transmitter
UDP	User Datagram Protocol
UL	Up Link
USB	Universal Serial Bus
USIM	Universal Subscriber Identity Module
URC	Unsolicited result code
VIH	Logic High level of input voltage
VIL	Logic Low level of input voltage
VOH	Logic High level of output voltage
VOL	Logic Low level of output voltage

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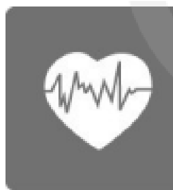
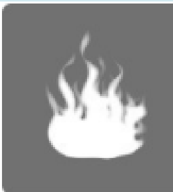
SAFETY INFORMATION

The following safety precautions must be observed during all phases of the operation, such as usage, service or repair of any cellular terminal or mobile incorporating ME3610 module. Manufacturers of the cellular terminal should send the following safety information to users and operating personnel and to incorporate these guidelines into all manuals supplied with the product. If not so, ZTEWelink does not take on any liability for customer failure to comply with these precautions.

	Full attention must be given to driving at all times in order to reduce the risk of an accident. Using a mobile while driving (even with a hands free kit) cause distraction and can lead to an accident. You must comply with laws and regulations restricting the use of wireless devices while driving.
	Switch off the cellular terminal or mobile before boarding an aircraft. Make sure it switched off. The operation of wireless appliances in an aircraft is forbidden to prevent interference with communication systems. Consult the airline staff about the use of wireless devices on boarding the aircraft, if your device offers a Airplane Mode which must be enabled prior to boarding an aircraft.
	Switch off your wireless device when in hospitals or clinics or other health care facilities. These requests are designed to prevent possible interference with sensitive medical equipment.
	GSM cellular terminals or mobiles operate over radio frequency signal and cellular network and cannot be guaranteed to connect in all conditions, for example no mobile fee or an invalid SIM card. While you are in this condition and need emergent help, please remember using emergency call. In order to make or receive call, the cellular terminal or mobile must be switched on and in a service area with adequate cellular signal strength.
	Your cellular terminal or mobile contains a transmitter and receiver. When it is on, it receives and transmits radio frequency energy. RF interference can occur if it is used close to TV set, radio, computer or other electric equipment.
	In locations with potentially explosive atmospheres, obey all posted signs to turn off wireless devices such as your phone or other cellular terminals. Areas with potentially explosive atmospheres including fuelling areas, below decks on boats, fuel or chemical transfer or storage facilities, areas where the air contains chemicals or particles such as grain, dust or metal powders.

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Note: Consult our website for up-to-date product descriptions, documentation, application notes, firmware upgrades, troubleshooting tips, and press releases

Besides, ZTEWelink provides various technical support ways to the customers, such as support by phone, website, instant messaging, E-mail and on-site.

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1. PRODUCT OVERVIEW

1.1. GENERAL DESCRIPTION

ME3630 is a GSM/CDMA/ WCDMA/ TD-SCDMA/LTE TDD/LTE FDD wireless communication module with LCC interface. It is widely applied to but not limited to the various products and equipment such as laptops, vehicle-mounted terminals, and electric devices, by providing data services.

ME3630 a GSM/CDMA/ WCDMA/ TD-SCDMA/LTE TDD/LTE FDD wireless communication module. ME3630 contains three variants ME3630-C1A, ME3630-C1B, ME3630-U1A, ME3630-E1A. Customer can choose the dedicated type based on the wireless network configuration. The following tables show entire radio band configuration of ME3630 series.

Table 1-1 ME3630 Reference Using Area

Variants	Description
ME3630-C1A	GSM B3/8,CDMA1X CDMA EVDO,WCDMA B1,TD-SCDMA B34/39,LTE FDD B1/3,LTE TDD B38/39/40/41 for China
ME3630-C1B	GSM B3/8，CDMA1X CDMA EVDO，WCDMA B1，TD-SCDMA B34/39，LTE FDD B1/3，LTE TDD B38/39/40/41 （GNSS and Rx-diversity are not supported yet）for China
ME3630-U1A	WCDMA B2/5,LTE FDD B2/4/5/12/17 for America
ME3630-E1A	GSM B3/8,WCDMA B1/8,LTE FDD B1/3/7/8/20 for Europe

Table 1-2 ME3630 Supported Band

PID	RF support	RF Band	Transmit Frequency (TX)	Receive Frequency (RX)	Maximum Output Power
ME3630-C1A	GSM	B3	1710 to 1785 MHz	1805 to 1880 MHz	30dBm±2dBm
		B8	880 to 915 MHz	925 to 960 MHz	33dBm±2dBm
	CDMA (EVDO/CDMA1X)	BC0	824 to 849MHz	869 to 894 MHz	23dBm~30dBm
	WCDMA	B1	1920 to 1980 MHz	2110 to 2170 MHz	24dBm+1/-3dBm
	TD-SCDMA	B34	2010 to 2025 MHz	2010 to 2025 MHz	24dBm+1/-3dBm
		B39	1880 to 1920 MHz	1880 to 1920 MHz	24dBm+1/-3dBm
	LTE FDD	B1	1920 to 1980 MHz	2110 to 2170 MHz	23dBm±2.7dBm
		B3	1710 to 1785 MHz	1805 to 1880MHZ	23dBm±2.7dBm
	LTE TDD	B38	2570 to 2620MHZ	2570 to 2620MHZ	23dBm±2.7dBm
		B39	1880 to 1920MHZ	1880 to 1920MHZ	23dBm±2.7dBm
		B40	2300 to 2400MHZ	2300 to 2400MHZ	23dBm±2.7dBm
		B41	2496 to 2690MHZ	2496 to 2690MHZ	23dBm±2.7dBm
ME3630-U1A	LTE FDD	B2	1850 to 1910 MHz	1930 to 1990 MHz	23dBm±2.7dBm
		B4	1710 to 1755 MHz	2110 to 2155 MHz	23dBm±2.7dBm
		B5	824 to 849 MHz	869 to 894 MHz	23dBm±2.7dBm
		B12	698 to 716 MHz	728 to 746 MHz	23dBm±2.7dBm
		B17	704 to 716 MHz	734 to 746 MHz	23dBm±2.7dBm
	WCDMA	B2	1850 to 1910 MHz	1930 to 1990 MHz	24dBm+1/-3dBm
		B5	824 to 849 MHz	869 to 894 MHz	24dBm+1/-3dBm

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ME3630-E1A	LTE FDD	B1	1920 to 1980 MHz	2110 to 2170 MHz	23dBm±2.7dBm
		B3	1710 to 1785 MHz	1805 to 1880 MHz	23dBm±2.7dBm
		B7	2500 to 2570 MHz	2620 to 2690 MHz	23dBm±2.7dBm
		B8	880 to 915 MHz	925 to 960 MHz	23dBm±2.7dBm
		B20	832 to 862 MHz	791 to 821 MHz	23dBm±2.7dBm
	WCDMA	B1	1920 to 1980 MHz	2110 to 2170 MHz	24dBm+1/-3dBm
		B8	880 to 915MHZ	925 to 960MHZ	24dBm+1/-3dBm
	GSM	B3	1710 to 1785 MHz	1805 to 1880 MHz	30dBm±2dBm
		B8	880 to 915 MHz	925 to 960 MHz	33dBm±2dBm

NOTE:

- **For convenience of description, in the next content, the "ME3630" means the "ME3630 product serials".**
- **With a tiny profile of 30.0mm×30.0mm×2.3mm (without label, the label is 0.1mm), ME3630 can meet almost all requirements for M2M application such as automotive, metering, tracking system, security solutions, routers, wireless POS, mobile computing devices, PDA phone and tablet PC, etc.**
- **ME3630 is an SMD type module, which can be embedded in customer application through its 96-pin pads including 80 LCC signal pads and 16 ground pads.**
- **ME3630 is integrated with internet service protocols like TCP/UDP and PPP. Extended AT commands have been developed for customer to use these internet service protocols easily.**

1.2. Key Features

The table below describes the detailed features of the ME3630 module.

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Table 1-3 ME3630 Key Features

Feature	Description	
Physical	Small form factor-30 mm × 30 mm × 2.3mm RF connection pads (RF main interface) LCC with 80 pins	
Power Supply	The range of voltage supply is 3.4V-4.2V, typical value is 3.8V	
Frequency Bands	C1A/C1B	LTE FDD B1/B3 LTE TDD B38/B39/B40/B41 WCDMA B1 CDMA BC0 TD-SCDMA B34/B39 GSM B3/B8
	U1A	LTE FDD B2/B4 /B5/B12/B17 WCDMA B2/B5
	E1A	LTE FDD B1/B3 /B7/B8/B20 WCDMA B1/B8 GSM B3/B8
Transmission Date	LTE : Max 150Mbps(DL)/Max 50Mbps(UL)	
Transmitting Power	Class 3 (23dBm±2.7dBm) for LTE	
Internet Protocol Features	Support TCP/PPP/UDP protocols Support the protocols PAP and CHAP usually used for PPP connections	
USIM Interface	1.8v/3v support SIM extraction/hot plug detection Support SIM and USIM Supports SIM application tool kit with proactive SIM commands	
UART Interface	Support two UART interface: main UART interface and debug UART interface Main UART interface: Eight lines on main UART interface Support RTS and CTS hardware flow control Baud rate can reach up to 921600 bps,115200 bps by default Used for AT command, data transmission or firmware upgrade Multiplexing function Debug UART interface: Two lines on debug UART interface, can be used for software debug, firmware upgrade	
USB Interface	Compliant with USB 2.0 specification (slave only) Used for AT command communication, data transmission, software debug and firmware upgrade. USB Driver: Support Windows XP, Windows Vista, Windows 7, Windows 8, Windows	

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	10,Windows CE5.0/6.0 and later, Linux 2.6.20 and later, Android 2.3/4.X/5.X
SDIO interface	1.8v support (full speed) 4bits,SDIO compatible to WLAN (802.11)
Antenna Interface	Include main antenna ,diversity antenna and GPS antenna(C1B is not included)
Rx-diversity	Support WCDMA/LTE Rx-diversity(C1B is not included)
AT commands	Compliant with 3GPP TS 27.007,27.005 and ZTEWelink enhanced AT commands
Network Indication	Use LED_MODE to indicate network connectivity status
SMS	Text and PDU mode Point to point MO and MT SMS saving/reading to SIM card or ME storage SMS cell broadcast
Temperature Range	Normal operation: -30°C to +75°C Restricted operation[1)]: -40°C~ -30°C and +75°C~ +85°C[1)] Storage temperature: -40°C to +85°C
Firmware Upgrade	USB interface or main UART interface, debug UART interface

NOTE:

1.[1)]means when the module works within this temperature range, RF performance might degrade. For example, the frequency error and the phase error would increase.

1.3. Function Diagram

The figure below shows a block diagram of the ME3630 and illustrates the major functional parts.

- Power management
- Baseband
- Memory (512MB flash + 256MB LPDDR2)
- Radio frequency
- Peripheral interface

--UART interface

--USIM card interface

--USB interface

--SDIO interface

--SPI interface

--I2C interface

--ADC interface

--Status interface (LED)

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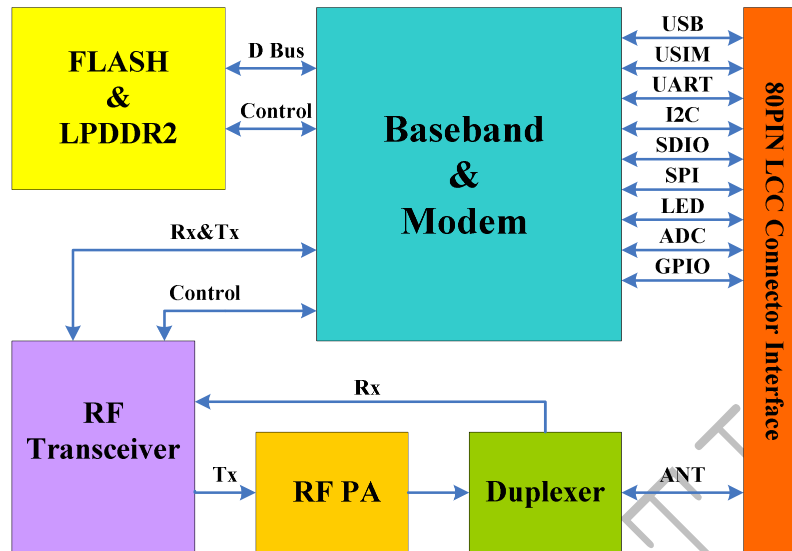

Figure 1-1 System Connection Structure

1.4. Evaluation Board

In order to help you to develop applications with ME3630, ZTEWelink supplies an evaluation board (G2000), RS-232 to USB cable, USB data cable, power adapter, antenna and other peripherals to control or test the module. For details, please refer to the related document ***[ZTEWelink G2000 Dev Board User Guide_V1.2].***

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2. Application Interface

2.1. General Description

ME3630 is equipped with an 80-pin 0.72mm pitch SMT pads plus 16-pin ground pads and reserved pads that connect to customer's cellular application platform. Sub-interface included in these pads is described in detail in the following chapters:

- Pin assignment
- Pin description
- Power supply
- Turn on/off scenarios
- USIM interface
- USB interface
- HSIC interface
- UART interface
- SDIO interface
- SPI interface
- Network status interface (LED)
- ADC interface
- WAKEUP_OUT signal
- GPIO interface

2.2. Pin Assignment

The following figure shows the pin assignment of the ME3630 module.

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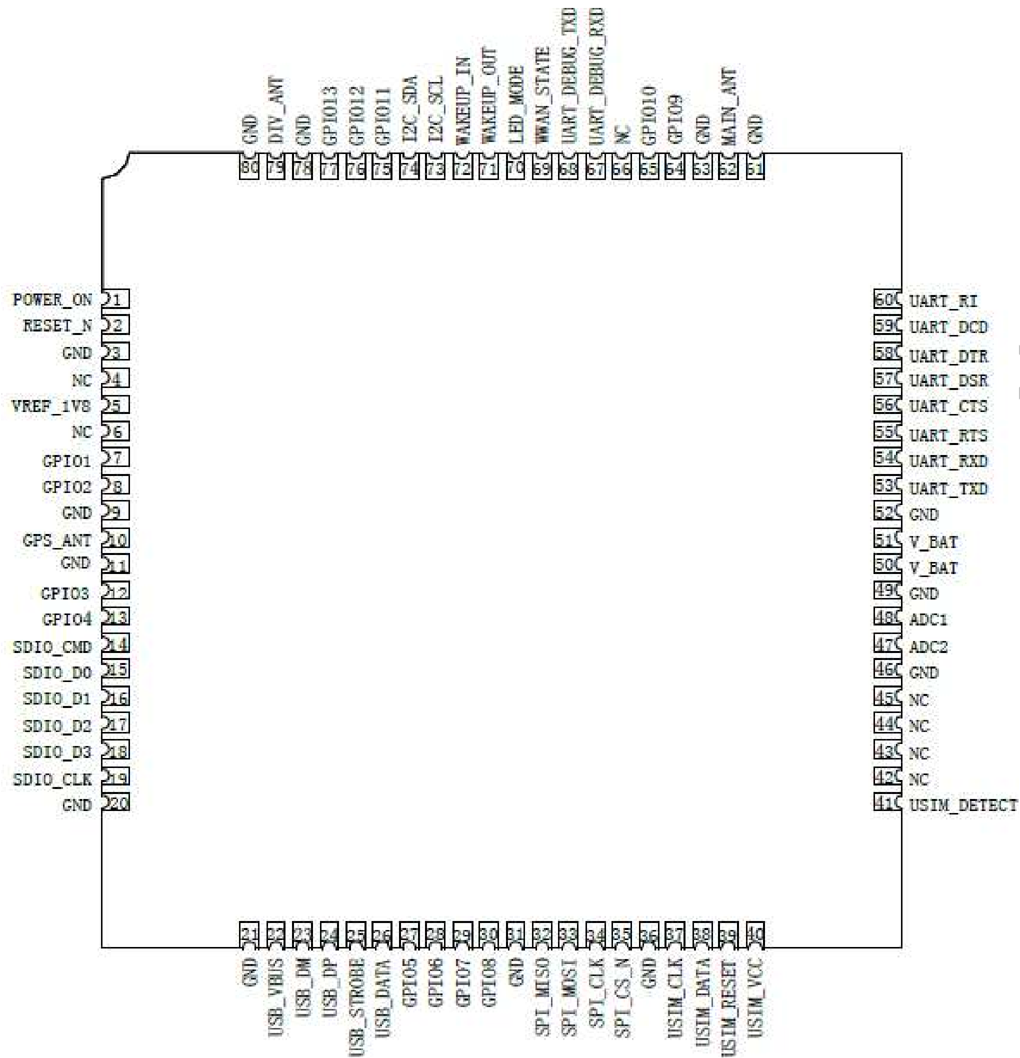

Figure 2-1 Pin Assignment

NOTE: Keep all reserved pins and unused pins unconnected.

2.3. Pin Description

The following table shows the IO Parameters Definition.

Table 2-1 IO Parameters Definition

Type	Description
IO	Bidirectional input/output
DI	Digital input
DO	Digital output
PI	Power input
PO	Power output
AI	Analog input
AO	Analog output
OD	Open drain

The logic levels are described in the following table.

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Table 2-2 Logic levels Description

Parameter	Min	Max	Unit
VIH	0.65*VDD_IO	VDD_IO+0.3	V
VIL	-0.3	0.35* VDD_IO	V
VOH	VDD_IO-0.45	VDD_IO	V
VOL	0	0.45	V

NOTE: VDD_IO is the voltage level of pins.

The following tables show the ME3630's pin definition.

Table 2-3 Pin Description

Power Supply					
Pin Name	**Pin NO.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
V_BAT	50.51	PI	Power supply for module	Vmax = 4.2V Vmin = 3.4V Vnorm = 3.8V	It must be able to provide sufficient current in a transmitting burst which typically rises to 2.0A
VREF_1V8	5	PO	Provide 1.8V for external circuit	Vnorm = 1.8V Imax = 300mA	Power supply for external GPIO'S pull up circuits
GND	3,9,11,20,21,31,36, 46,49,52, 61,63,78, 80,		Ground		
Turn On/Off					
Pin Name	**Pin NO.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
POWER_ON	1	DI	Turn on/off module	V_{IH} max = 2.1V V_{IH} min = 1.17V V_{IL} max = 0.63V	Pull-up to 1.8V through 100K resistance, active low
RESET_N	2	DI	Reset module	V_{IH} max = 2.1V V_{IH} min = 1.17V V_{IL} max = 0.63V	Pull-up to 1.8V through 100K resistance, active low
Status Indication					
Pin Name	**Pin NO.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
LED_MODE	70	DO	Indicate the module network registration mode	V_{OH} min = 1.35V V_{OL} max = 0.45V	1.8V power domain
USB Interface					
Pin Name	**Pin NO.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
USB_DP	24	IO	USB differential data bus	Compliant with USB 2.0 standard specification	Require differential impedance of 90Ω
USB_DM	23	IO			
USB_VBUS	22	PI	USB power		

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HSIC Interface					
Pin Name	Pin NO.	I/O	Description	DC Characteristics	Comment
USB_STROBE	25	IO	HSIC strobe	InterChip USB(HSIC)	Require differential impedance of 90Ω
USB_DATA	26	IO	HSIC data		
USIM Interface					
Pin Name	**Pin NO.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
USIM_VCC	40	PO	Power supply for USIM card	For 1.8V USIM: Vmax = 1.9V Vmin = 1.7V For 3.0V USIM: Vmax = 3.05V Vmin = 2.7V I_O max = 50mA	Either 1.8V or 3V is supported by the module automatically
USIM_DATA	38	IO	Data signal of USIM card	For 1.8V USIM: V_{IL} max = 0.63V V_{IH} min = 1.17V V_{OL} max = 0.45V V_{OH} min = 1.35V For 3V USIM: V_{IL} max = 1.05V V_{IH} min = 1.95V V_{OL} max = 0.45V V_{OH} min = 2.6V	Pull-up to USIM_VCC with 10k resistor internally
USIM_CLK	37	DO	Clock signal of USIM card	For 1.8V USIM: V_{OL} max = 0.45V V_{OH} min = 1.35V For 3V USIM: V_{OL} max = 0.45V V_{OH} min = 2.6V	
USIM_RST	39	DO	Reset signal of USIM card	For 1.8V USIM: V_{OL} max = 0.45V V_{OH} min = 1.35V For 3V USIM: V_{OL} max = 0.45V V_{OH} min = 2.6V	
USIM_DETECT	41	DI	USIM card input detection	V_{IL} min = -0.3V V_{IL} max = 0.63V V_{IH} min = 1.17V V_{IH} max = 2.1V	1.8V power domain. Pulled up by default. Active low
ADC Interface					

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Pin Name	Pin NO.	I/O	Description	DC Characteristics	Comment
ADC1	48	AI	Analog to digital	0.05V to 1.75V	
ADC2	47	AI	Analog to digital	0.05V to 1.75V	
Main UART Interface					
Pin Name	**Pin NO.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
UART_RI	60	DO	Ring indicator	V_{OL} max = 0.45V V_{OH} min = 1.35V	1.8V power domain
UART_DCD	59	DO	Data carrier detection	V_{OL} max = 0.45V V_{OH} min = 1.35V	1.8V power domain
UART_CTS	56	DO	Clear to send	V_{OL} max = 0.45V V_{OH} min = 1.35V	1.8V power domain
UART_RTS	55	DI	Request to send	V_{IL} min = -0.3V V_{IL} max = 0.63V V_{IH} min = 1.17V V_{IH} max = 2.1V	1.8V power domain
UART_DTR	58	DI	Data terminal ready	V_{IL} min = -0.3V V_{IL} max = 0.63V V_{IH} min = 1.17V V_{IH} max = 2.1V	1.8V power domain.
UART_DSR	57	DI	Data set ready	V_{IL} min = -0.3V V_{IL} max = 0.63V V_{IH} min = 1.17V V_{IH} max = 2.1V	1.8V power domain.
UART_TXD	53	DO	Transmit data	V_{OL} max = 0.45V V_{OH} min = 1.35V	1.8V power domain
UART_RXD	54	DI	Receive data	V_{IL} min = -0.3V V_{IL} max = 0.63V V_{IH} min = 1.17V V_{IH} max = 2.1V	1.8V power domain
Debug UART Interface					
Pin Name	**Pin NO.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
UART_DEBUG_TXD	68	DO	Transmit data	V_{OL} max = 0.45V V_{OH} min = 1.35V	1.8V power domain
UART_DEBUG_RXD	67	DI	Receive data	V_{IL} min = -0.3V V_{IL} max = 0.63V V_{IH} min = 1.17V V_{IH} max = 2.1V	1.8V power domain
RF Interface					
Pin Name	**Pin NO.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
MAIN_ANT	62	IO	Main antenna	50Ω impedance	

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DIV_ANT	79	AI	Diversity antenna	50Ω impedance	
GPS_ANT	10	IO	GPS antenna	50Ω impedance	
I2C Interface					
Pin Name	**Pin NO.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
I2C_SCL	73	DO	I2C serial clock	V_{OL} max = 0.45V V_{OH} min = 1.35V	External pull-up resistor is required
I2C_SDA	74	IO	I2C serial data	V_{OL} max = 0.45V V_{OH} min = 1.35V V_{IL} min = -0.3V V_{IL} max = 0.63V V_{IH} min = 1.17V V_{IH} max = 2.1V	External pull-up resistor is required
SDIO Interface					
Pin Name	**Pin NO.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
SDIO_CMD	14	IO	Secure digital CMD	V_{OL} max = 0.45V V_{OH} min = 1.35V V_{IL} min = -0.3V V_{IL} max = 0.63V V_{IH} min = 1.17V VIH max = 2.1V	1.8V power domain External pull-up 10k resistor is required
SDIO_CLK	19	DO	Secure digital CLK	V_{OL} max = 0.45V **V_{OH} min = 1.35V**	**1.8V power domain**
SDIO_D0	15	IO	Secure digital IO data bit 0	V_{OL} max = 0.45V V_{OH} min = 1.35V V_{IL} min = -0.3V V_{IL} max = 0.63V V_{IH} min = 1.17V **VIH max = 2.1V**	**1.8V power domain**
SDIO_D1	16	IO	Secure digital IO data bit 1	V_{OL} max = 0.45V V_{OH} min = 1.35V V_{IL} min = -0.3V V_{IL} max = 0.63V V_{IH} min = 1.17V **VIH max = 2.1V**	**1.8V power domain**
SDIO_D2	17	IO	Secure digital IO data bit 2	V_{OL} max = 0.45V V_{OH} min = 1.35V V_{IL} min = -0.3V V_{IL} max = 0.63V V_{IH} min = 1.17V **VIH max = 2.1V**	**1.8V power domain**

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SDIO_D3	18	IO	Secure digital IO data bit 3	V_{OL} max = 0.45V V_{OH} min = 1.35V V_{IL} min = -0.3V V_{IL} max = 0.63V V_{IH} min = 1.17V **VIH max = 2.1V**	**1.8V power domain**
SDIO Interface					
Pin Name	**Pin NO.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
SPI_MISO	32	IO	SPI main input slave output	V_{OL} max = 0.45V V_{OH} min = 1.35V V_{IL} min = -0.3V V_{IL} max = 0.63V V_{IH} min = 1.17V VIH max = 2.1V	1.8V power domain
SPI_MOSI	33	IO	SPI main output slave input	V_{OL} max = 0.45V V_{OH} min = 1.35V V_{IL} min = -0.3V V_{IL} max = 0.63V V_{IH} min = 1.17V VIH max = 2.1V	1.8V power domain
SPI_CLK	34	DO	SPI clock	V_{OL} max = 0.45V V_{OH} min = 1.35V	1.8V power domain
SPI_CS_N	35	DO	SPI segment	V_{OL} max = 0.45V V_{OH} min = 1.35V	1.8V power domain
Other Pins					
Pin Name	**Pin NO.**	**I/O**	**Description**	**DC Characteristics**	**Comment**
WAKEUP_IN	72	DI	Sleep mode control	V_{IL} min = -0.3V V_{IL} max = 0.45V V_{IH} min = 1.53V V_{IH} max = 2.1V	1.8V power domain. Pull-up by default. Low level wakes up the module
WAKEUP_OUT	71	DO	Output wakeup signal	V_{OL} max = 0.8V V_{OH} min = 1.35V	Wakeup external circuits
GPIO	7, 8, 12, 13, 27, 28, 29, 30, 64, 65, 75, 76,7 7	IO	General input/output	V_{OL} max = 0.45V V_{OH} min = 1.35V V_{IL} min = -0.3V V_{IL} max = 0.63V V_{IH} min = 1.17V VIH max = 2.1V	If unused, keep them floating.
NC	4,6,66,42,43,44,45		No connection		NC

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2.4. Power Supply

2.4.1. Power Supply Pins

The ME3630 is supplied through the V_BAT signal with the following characteristics.

Table 2-4 Power Supply

Pin Name	Pin NO.	Description	Minimum	Typical	Maximum	Unit
V_BAT	50,51	Power supply for module	3.4	3.8	4.2	V
GND	3, 9, 11, 20, 21, 31, 36, 46, 49, 52, 61, 63, 78, 80,	Ground	-		-	

GND signal (Pin No: 3/9/11/20/21/31/36/46/49/52/61/63/78/80) is the power and signal ground of the module, which needs to be connected to the ground on the system board. If the GND signal is not connected completely, the performance of module will be affected.

2.4.2. Decrease Voltage Drop

The power supply range of the module is 3.4V~ 4.2V. Because of the voltage drop during the transmitting time, a bypass capacitor of about 100 µF with low ESR should be used. Multi -layer ceramic chip (MLCC) capacitor can provide the best combination of low ESR. Three ceramic capacitors (100nF, 33pF, 10pF) are recommended to be applied to the V_BAT pins. The capacitors should be placed close to the ME3630's V_BAT pins. The following figure shows structure of the power supply.

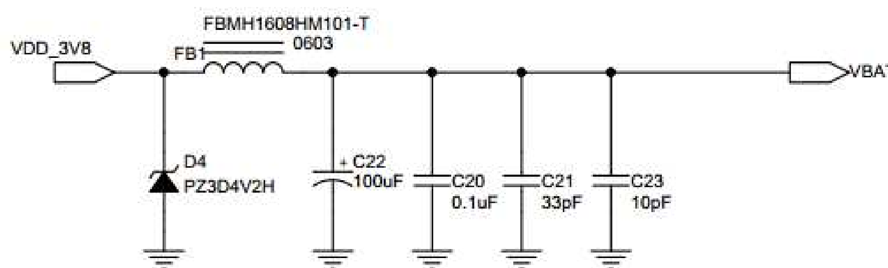

Figure 2-2 Structure of the Power Supply

NOTES: The rated current of FB1 should be more than 2.5A.

The PCB traces from the V_BAT pins to the power source must be wide enough to ensure that there isn't too much voltage drop occurs in the transmitting procedure. The width of V_BAT trace should be no less than 2mm, and the principle of the V_BAT trace is the longer, the wider.

In poor situation of the network is, the antenna will transmit at the maximum power, and the transient maximum peak current can reach as high as 2A. So the power supply capacity of system board needs to be above 2.5A to satisfy the requirement of module peak current; and the average current on the system side needs to be above 0.9A.

2.4.3. Reference Circuit of Power Supply

- **Option One: DC\DC switching**

The over-current capability requirement of DC/DC switching power supply needs to be above 2.5A. The reference circuit of AAT2138 shows as figure below. Place a tantalum capacitor of 330uF at the input of the chip. Place a 220uF and 33uF capacitor tantalum capacitors at the output of the chip. This circuit fully meets the module power requirements. The current capacity of inductance L5 is greater than 3A,Please visit ***http://www.analogictech.com*** for more information of AAT2138.

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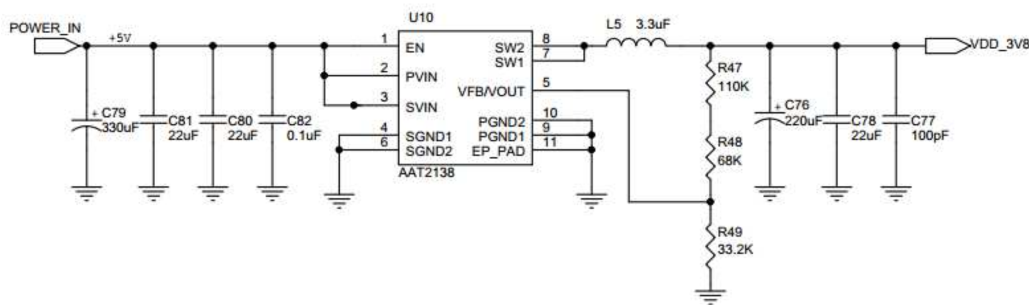

Figure 2-3 Reference circuit of AAT2138

- **Option Two: LDO**

The over-current capability of LDO is above 2.5A.

As the poor transient response of linear regulator, large capacitors should be placed at the input and output of LDO, place a capacitor above 100uF at output of LDO,R2、R3 recommend 1% accuracy. The reference power supply circuit design with LDO is shown as figure below:

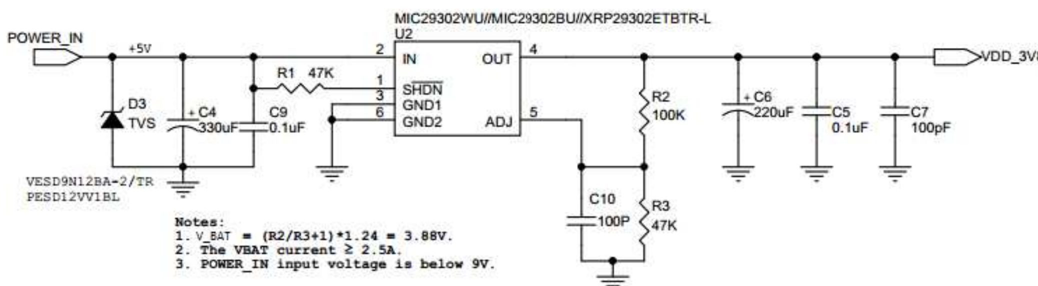

Figure 2-4 Reference circuit of LDO

2.5. Turn on Scenarios

The following table shows the pin definition of POWER_ON/OFF.

Table 2-5 POWER_ON/OFF Pin Description

Pin Name	Pin NO.	I/O	Description	Comment
POWER_ON	1	DI	Turn on/off the module	1.8V power domain， low active

The power on scenarios is illustrated as the following figure, the module power on and running when the POWER_ON pin keep in low level.

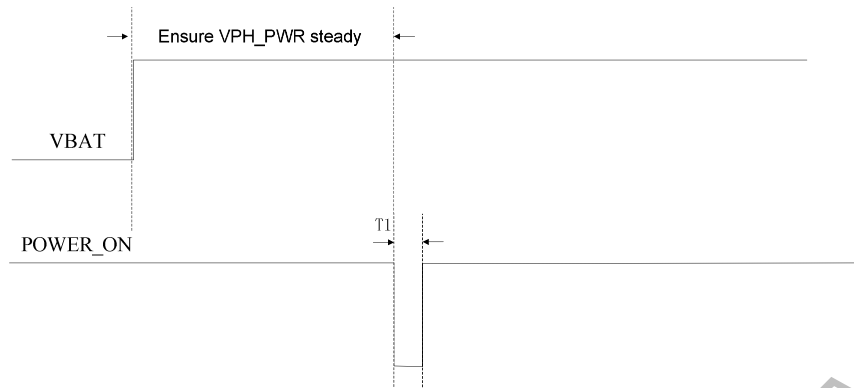

Figure 2-5 Timing of Turning on Mode

Table 2-6 Power-on Time

Parameter	Description	Min	Typical	Max	Unit
T1	The period that the Power-on signal for power on operation is kept on the low PWL	0.1	0.5	--	second

2.6. USIM Card Interface

2.6.1. Description of PINs

The USIM card interface circuitry meets ETSI and IMT-2000 SIM interface requirements. Both 1.8V and 3.0V USIM cards are supported.

Table 2-7 Pin Definition of the USIM Interface

Pin Name	Pin NO.	I/O	Description	Comment
USIM_VCC	40	PO	Power supply for USIM card	Either 1.8V or 3V is supported by the module automatically
USIM_DATA	38	IO	Data signal of USIM card	Pull-up to USIM_VDD with 10k resistor internally
USIM_CLK	37	DO	Clock signal of USIM card	
USIM_RST	39	DO	Reset signal of USIM card	
USIM_DETECT	41	DI	USIM card input detection	1.8V power domain
GND	36		Ground	

The following figure shows the reference design of the 8-pin USIM card.

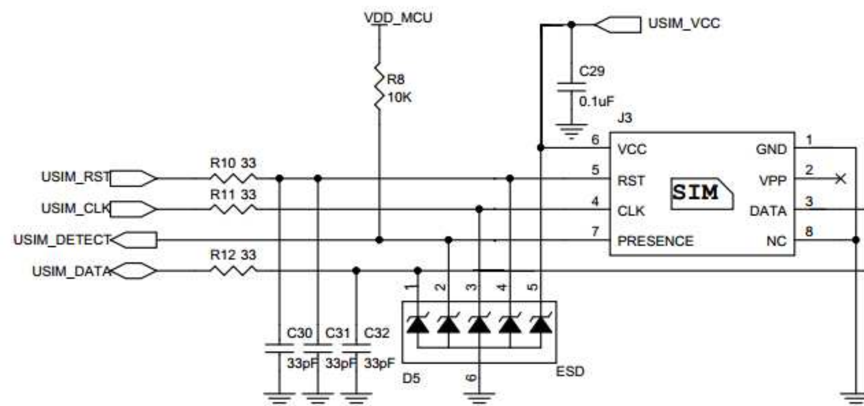

Figure 2-6 Reference Circuit of the 8 Pin USIM Card

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NOTES:

1. R10~R12 and D5 are applied to suppress the EMI spurious transmission and enhance the ESD protection.Should be closed to J3.

2.USIM_DETECT is used to detect USIM card, which will be low when the USIM card is inserted.

3.The value of C29 shoule be less than 1uF

4.USIM_DETECT is 1.8V power domain,VDD_MCU should be 1.8V.

ME3630 supports USIM card hot-plugging via the USIM_ DETECT pin. For details, refer to document ***[ME3630_AT_Commands_Manual_V1.0]***. If you do not need the USIM card detect function, keep USIM_ DETECT unconnected.

The reference circuit for using a 6-pin USIM card socket is illustrated as the following figure.

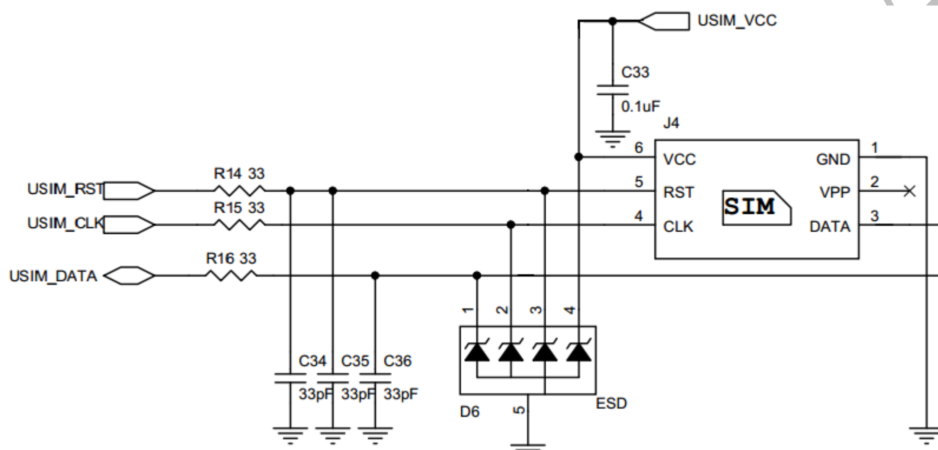

Figure 2-7 Reference Circuit of the 6 Pin USIM Card

NOTES:

1. R14~R16 and D6 are applied to suppress the EMI spurious transmission and enhance the ESD protection.D6 should be closed to J4

2.The value of C33 shoule be less than 1uF.

In order to enhance the reliability and availability of the USIM card in customer's application, please follow the following criterion in the USIM circuit design:

- Keep layout of USIM card as close as possible to the module. Assure the possibility of the length of the trace is less than 50mm.
- Keep USIM card signal away from RF and V_BAT alignment.
- Assure the ground between module and USIM cassette short and wide. Keep the width of ground and USIM_VCC no less than 0.5mm to maintain the same electric potential. The decouple capacitor of USIM_VCC should be less than 1uF and must be near to USIM cassette.
- To avoid cross-talk between USIM_DATA and USIM_CLK, keep them away with each other and shield them with surrounded ground.
- In order to offer good ESD protection, it is recommended to add TVS such as WILL (http://www.willsemi.com) ESDA6V8AV6. The 33Ω resistors should be added in series between the module and the USIM card so as to suppress the EMI spurious transmission and enhance the ESD protection. Please note that the USIM peripheral circuit should be close to the USIM card socket.
- The pull-up resistor on USIM_DATA line can improve anti-jamming capability when long layout trace and sensitive occasion is applied.

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2.6.2. Design Considerations for USIM Card Holder

For 8-pin USIM card holder, it is recommended to use Molex 91228.

Please visit **http://www.molex.com** for more information.

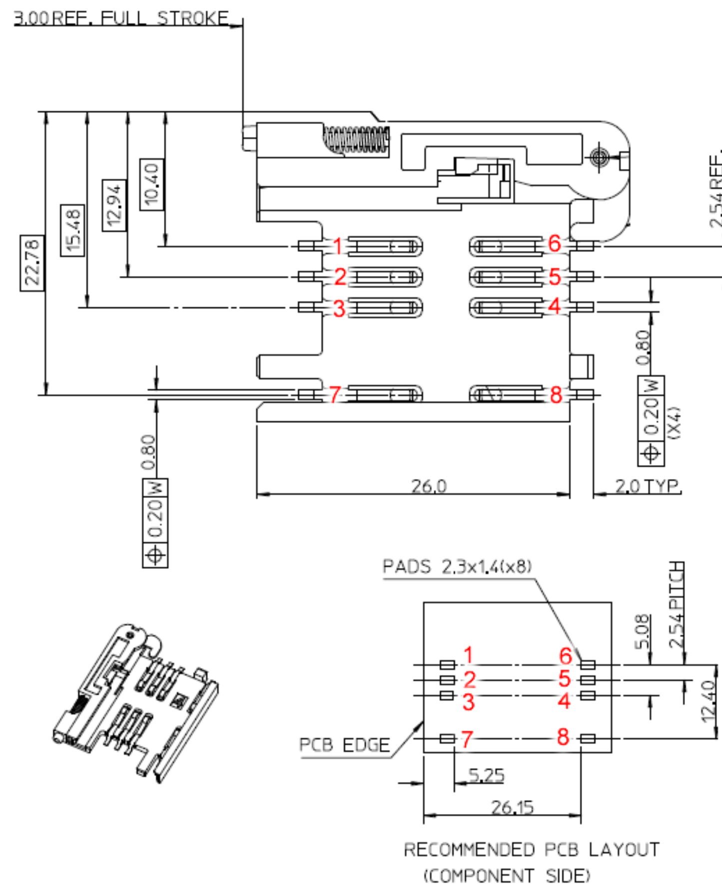

Figure 2-8 Molex 91228 USIM Card Holder

Table 2-8 Pin Description of Molex USIM Card Holder

Pin Name	Pin NO.	Function
GND	1	Ground
VPP	2	Not connected
DATA I/O	3	USIM card data
CLK	4	USIM card clock
RST	5	USIM card reset
VDD	6	USIM card power supply
/	7	Pull-down GND with external circuit. When the tray is present, 4 is connected to 5
/	8	Not defined

For 6-pin USIM card holder, it is recommended to use Amphenol C707 10M006 512 2.

Please visit **http://www.amphenol.com** for more information.

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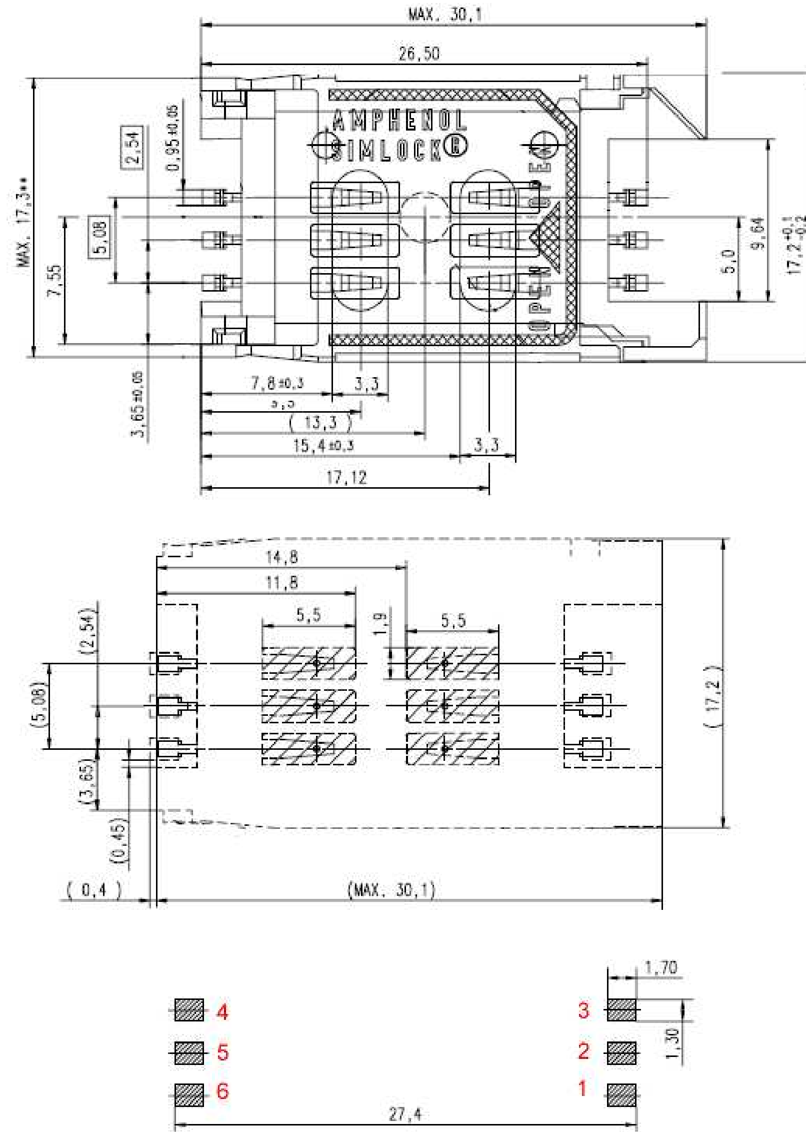

Figure 2-9 Amphenol C707 10M006 512 2 USIM Card Holder

Table 2-9 Pin Description of Amphenol USIM Card Holder

Pin Name	Pin NO.	Function
GND	1	Ground
VPP	2	Not connected
DATA I/O	3	USIM card data
CLK	4	USIM card clock
RST	5	USIM card reset
VDD	6	USIM card power supply

2.7. USB Interface

ME3630 contains one integrated USB transceiver which complies with the USB 2.0 specification and supports high speed (480 Mbps), full speed (12 Mbps) and low speed (1.5 Mbps) mode. The USB interface is primarily used for AT command, data transmission, software debug and firmware upgrade. The following table shows the pin definition of USB interface.

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Table 2-10 USB Pin Description

Pin Name	Pin NO.	I/O	Description	Comment
USB_DP	24	IO	USB differential data bus (positive)	Require differential impedance of 90Ω
USB_DM	23	IO	USB differential data bus (negative)	Require differential impedance of 90Ω
USB_VBUS	22	PI	USB power	USB plug detect
GND	21		Ground	

More details about the USB 2.0 specifications, please visit ***http://www.usb.org/home***.

For different use purposes, different designs can be referred to:

- When USB is not the desired function, connect differential signal, power and GND via test points.
- Connect USB interface to USB connector directly. The following figure shows the reference circuit of USB interface.

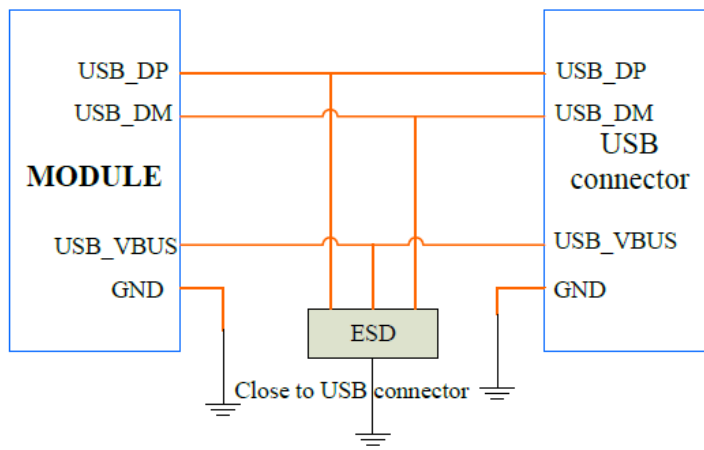

Figure 2-10 Reference Circuit of USB Application

- Reference Circuit of USB Communication between module and AP is the one below. The 0Ω in the figure should be placed near pin.

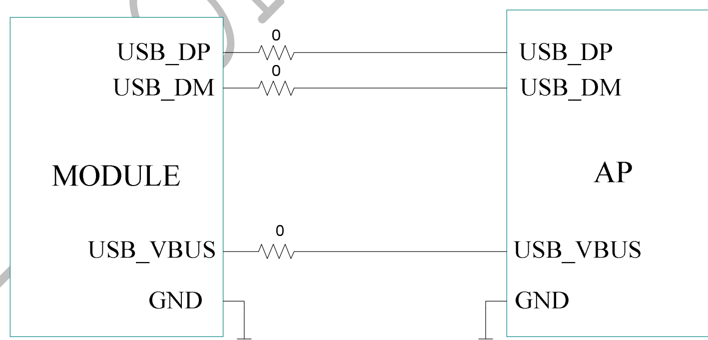

Figure 2-11 Reference Circuit of USB Communication between module and AP

In order to ensure the USB interface design corresponding with the USB 2.0 specification, please comply with the following principles.

It is important to route the USB signal traces as differential pairs with total grounding. The impedance of USB differential trace is 90ohm.

Pay attention to the influence of junction capacitance of ESD component on USB data lines. Typically, the capacitance value should be less than 2pF.

Do not route signal traces under crystals, oscillators, magnetic devices and RF signal traces. It is important to route the USB differential traces in inner-layer with ground shielding not only upper and lower layer but also right and left side.

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Keep the ESD components as closer to the USB connector as possible.

2.8. UART Interface

The module provides two UART interfaces: Main UART Port and Debug UART Port. The Main UART Port can work in full function mode while the Debug UART Port is used for software debugging or Firmware upgrade. The following show the different features.

Main UART interface support 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600bps baud rate, the default is 115200bps, This interface can be used for data transmission; AT communication or firmware upgrade (upgrade is not supported currently).

Debug UART interface supports 115200bps baud rate. It can be used for software debug and firmware upgrade. The module is designed as the DCE (Data Communication Equipment), following the traditional DCE-DTE (Data Terminal Equipment) connection.

The following tables show the pin definition of these two UART interfaces.

Table 2-11 Pin Definition of the Main UART Interface

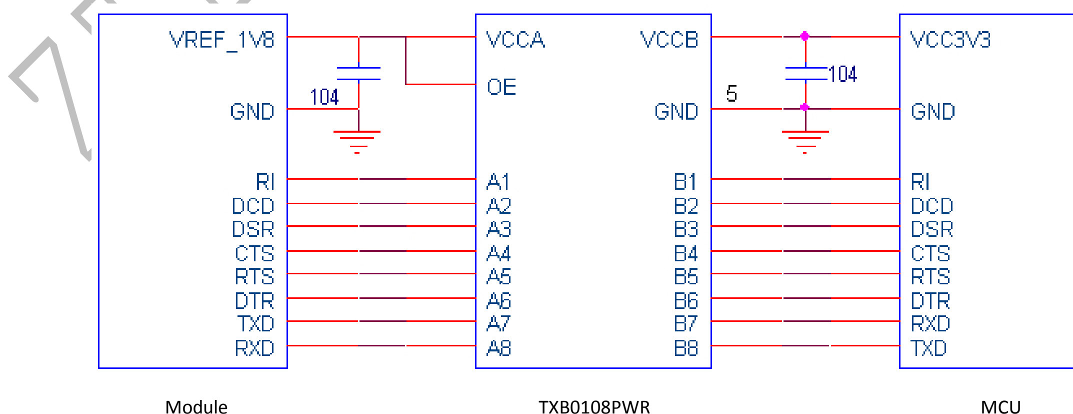
Pin Name	Pin NO.	I/O	Description	Comment
UART_RI	60	DO	Ring indicator	1.8V power domain
UART_DCD	59	DO	Data carrier detection	1.8V power domain
UART_CTS	56	DO	Clear to send	1.8V power domain
UART_RTS	55	DI	Request to send	1.8V power domain
UART_DTR	58	DI	Data terminal ready	1.8V power domain.
UART_DSR	57	DI	Data set ready	1.8V power domain.
UART_TXD	53	DO	Transmit data	1.8V power domain
UART_RXD	54	DI	Receive data	1.8V power domain

Table 2-12 Pin Definition of the Debug UART Interface

Pin Name	Pin NO.	I/O	Description	Comment
UART_DEBUG_TXD	68	DO	Transmit data	1.8V power domain
UART_DEBUG_RXD	67	DI	Receive data	1.8V power domain

Reference Circuit of Logic Level Translator

ME3630 provides you with a 1.8V UART interface. A level shifter should be used if your application is equipped with a 3.3V UART interface. A level shifter TXB0108PWR provided by ***Texas Instruments*** is recommended. The following figure shows the reference design of the TXB0108PWR.



Module TXB0108PWR MCU

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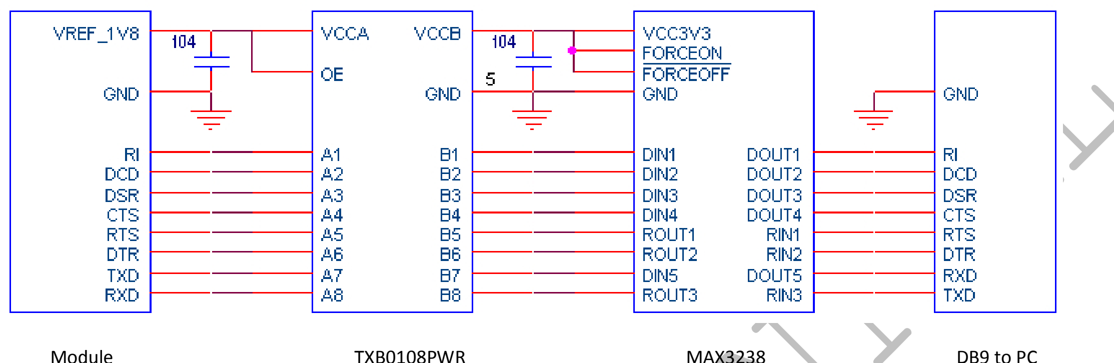
Figure 2-12 Reference Circuit of Logic Level Translator

Please visit ***http://www.ti.com*** for more information.

A. Reference Circuit between ME3630 and PC

The following figure is an example of connection between ME3630 and PC. A voltage level translator and a RS-232 level translator chip must be inserted between module and PC, since these two UART interfaces do not support the RS-232 level, while support the 1.8V CMOS level only.

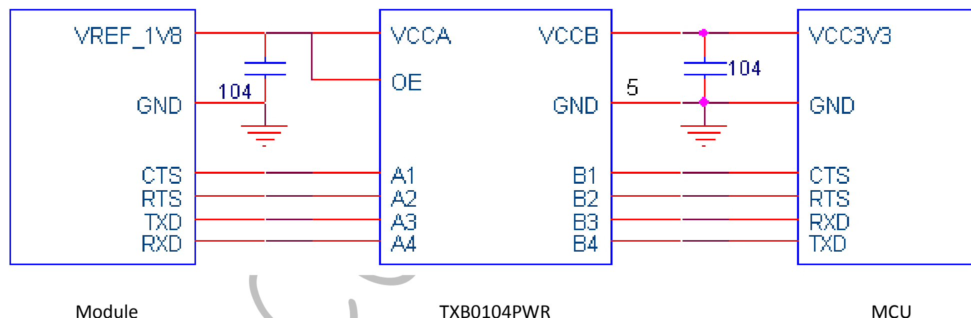


Module TXB0108PWR MAX3238 DB9 to PC

Figure 2-13 RS232 Level Match Circuit

B. Reference Circuit of Main URAT Port to 4 Line UART Port

The following figure shows the reference circuit of main UART interface with 4 line logic level translator. TXB0104PWR provided by ***Texas Instruments*** is recommended.

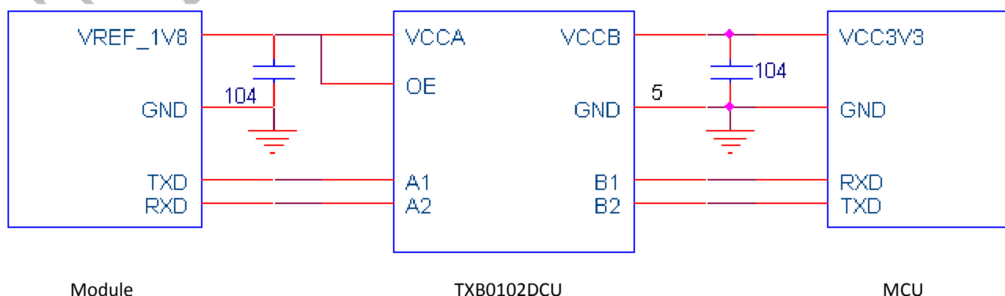


Module TXB0104PWR MCU

Figure 2-14 Reference Circuit of Main UART with 4 Line Level Translator

Reference Circuit of URAT Port to 2 line UART Port

The following figure shows the reference circuit of UART interfaces with 2 line logic level translator. TXB0102DCU provided by ***Texas Instruments*** is recommended.



Module TXB0102DCU MCU

Figure 2-15 Reference Circuit of UART with 2 Line Level Translator

Please visit ***http://www.ti.com*** for more information.

C. Debugging UART port

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Debugging UART port is a 2-wire interface. It should be connected with its test point or jumper pin during design.

2.9. Network Status Indication

The network indication pin LED_MODE can be used to drive a network status indicator LED. The different modes of status indicator flashing indicate different network statuses. The following tables describe pin definition and logic level changes in different network status.

Table 2-13 Pin Definition of Network Indicator

Pin Name	Pin NO.	I/O	Description	Comment
LED_MODE	70	DO	Indicate the module network registration mode	1.8V power domain

Table 2-14 Working State of the Network Indicator

LED Status	Module status
High level, LED on	Module is in the standby mode
Low level 1.8s(LED off), High level 0.2s(LED on)	PDP activated, and get the IP address
Low level 0.2s(LED off), High level 1.8s(LED on)	Socket established(when using External protocol stack, $MYSOCKETLED should be sent by CMUX to control the LED)

Figure below is the reference circuit design diagram.

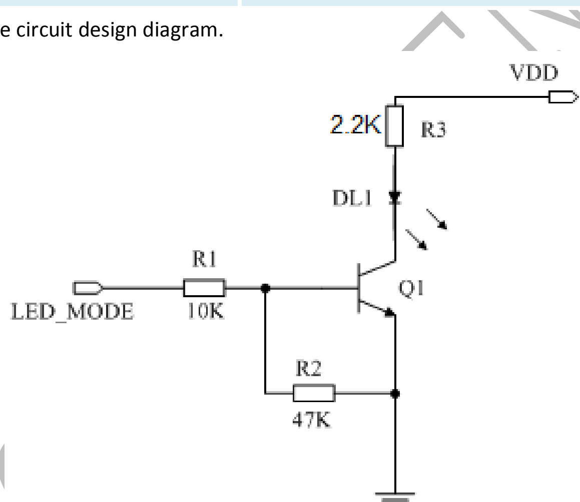

Figure 2-16 Reference Circuit of the Network Indicator

2.10. ADC Interface

The module provides two ADCs to digitize the analog signal to 10-bit digital data such as battery voltage, temperature and so on. Using AT command “AT+ZADC1?” can read the voltage value on ADC1 pin. Using AT command “AT+ZADC2?” can read the voltage value on ADC2 pin. The read value is expressed in mV. For more details of these AT commands, please refer to document ***[ME3630_AT_Commands_Manual_V1.0]***.

In order to improve the accuracy of ADC, the trace of ADC should be surrounded by ground.

Table 2-15 Pin Definition of the ADC

Pin Name	Pin NO.	Description
ADC1	48	General purpose analog to digital converter.
ADC2	47	General purpose analog to digital converter.

The following table describes the characteristic of the ADC function.

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Table 2-16 Characteristic of the ADC

Item	Min	Typ.	Max	Unit
ADC1 voltage range	0.05		1.75	V
ADC2 voltage range	0.05		1.75	V
ADC resolution			15	Bits

2.11. WAKEUP_OUT Signal

The module provides an AP control interface for communicating with external Application Processor including WAKEUP_OUT. The following table shows the pin definition of AP control interface.

Table 2-17 Pin Definition of WAKEUP_OUT

Pin Name	Pin NO.	I/O	Description	Comment
WAKEUP_OUT	71	DO	Output wakeup signal	1.8V power domain

When there is a SMS received by the module, it will output the level shown as the figure below through pin 71.

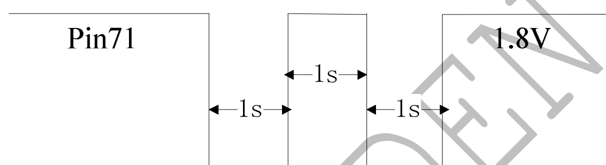

Figure 2-17 The output signal of WAKEUP_OUT

NOTE: WAKEUP_OUT is only supported SMS by the firmware version of ME3630 currently.

2.12. GPIO Interface

Module provides 8 GPIO pins. The direction and output voltage level of the GPIO can be set by AT command "AT+ZGPIO". The input voltage level of the GPIO can also be read by AT command "AT+ZGPIO". For more details of these AT commands, please refer to document ***[ME3630_AT_Commands_Manual_V1.0].***

Table 2-18 Pin Definition of GPIO

Pin Name	Pin NO.	I/O	Description	Comment
GPIO1	7	IO	General input/output	1.8V power domain
GPIO2	8	IO	General input/output	1.8V power domain
GPIO3	12	IO	General input/output	1.8V power domain
GPIO4	13	IO	General input/output	1.8V power domain
GPIO5	27	IO	General input/output	1.8V power domain
GPIO6	28	IO	General input/output	1.8V power domain
GPIO7	29	IO	General input/output	1.8V power domain
GPIO8	30	IO	General input/output	1.8V power domain
GPIO9	64	IO	General input/output	1.8V power domain
GPIO10	65	IO	General input/output	1.8V power domain
GPIO11	75	IO	General input/output	1.8V power domain
GPIO12	76	IO	General input/output	1.8V power domain
GPIO13	77	IO	General input/output	1.8V power domain

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3. Antenna Interface

ME3630 antenna interface includes a main antenna, an optional Rx-diversity antenna, which is used for improve receiving performance. The antenna interface has an impedance of 50Ω.

3.1. Pin Definition

The main antenna and Rx-diversity antenna pins definition are shown below.

Table 3-1 Pin Definition of GPIO

Pin Name	Pin NO.	I/O	Description	Comment
MAIN_ANT	62	IO	Main antenna	50Ω impedance
DIV_ANT	79	AI	Diversity antenna	50Ω impedance
GPS_ANT	10	IO	GPS antenna	50Ω impedance

3.2. Reference Design

The antenna is a sensitive device and its performance is greatly affected by external environments. The radiation performance of the antenna is affected by the module dimensions, antenna position, occupied space size of the antenna, and the grounding of surrounding components of the antenna. Besides, the fixed assembly of the antenna, the wiring of RF cables on the antenna, and the fixed position of the antenna all affect the radiation performance of the antenna too.

The reference design of main antenna and Rx-diversity antenna is shown as below. It should reserve a π-type matching circuit for better RF performance, and place these components as close as possible to the module. The capacitors are not mounted by default.

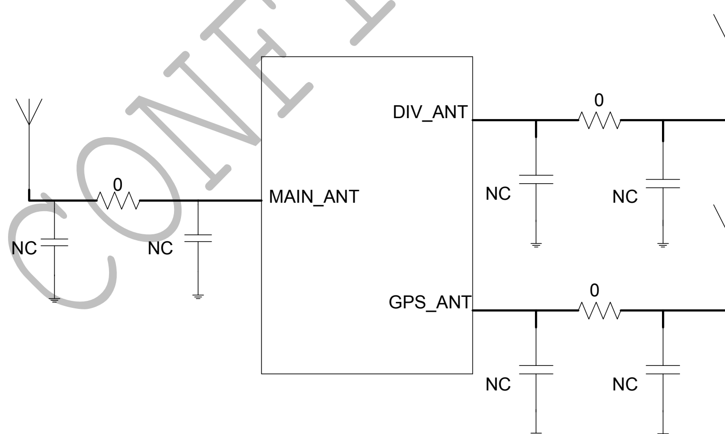

Figure 3-1 Reference Circuit of Antenna Interface

NOTE: Keep a proper distance between main and diversity antenna to improve the receiving sensitivity. GNSS and Rx-diversity are not supported by C1B, therefore GNNS antenna design is not concerned in C1B type.

3.3. Reference PCB Layout of Antenna

Please follow the following criterion in the process of antenna line PCB layout design:

Make sure that the transmission line's characteristic impedance is 50ohm;

Keep line on the PCB as short as possible, since the antenna line loss shall be less than 0.3 dB;

Line geometry should have uniform characteristics, constant cross section, avoid meanders and abrupt curves;

It is wise to surround the PCB transmission line with ground, avoid having other signal tracks facing directly the antenna line

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track.

Keep at least one layer of the PCB used only for the ground plane; and use this layer as reference ground plane for the transmission line;

- The ground surrounding the antenna line on PCB has to be strictly connected to the main Ground Plane by means of via holes (once per 2mm at least), placed close to the ground edges facing line track;
- Place EMI noisy devices as far as possible from modules antenna line;
- Keep the antenna line far away from the module power supply lines;
- If EM noisy devices are present on the PCB hosting the Module, such as fast switching ICs, take care of the shielding of the antenna line by burying it inside the layers of PCB and surround it with ground planes, or shield it with a metal frame cover.

3.4. Suggestions for EMC & ESD Design

3.4.1. EMC Design Requirements

During the design of the whole device, the user needs to fully consider the EMC problem caused by the signal integrity and power integrity.

During the product design, it is better to separate the module from the mainboard PCB, instead of installing the module on the ground of the mainboard. If they cannot be separated, the module should be far from modules and components that might generate EMI, such as chip and memory, power interface, and data cable interface.

Because the mainboard of PAD, CPE, and Internet laptops does not have a shielding cover, as that of mobile terminals, to shield most circuits to avoid overflow of electromagnetic interference, you can spray conductive paint on the surface on non-antenna areas within the structural components above and below the mainboard, and the conductive paint should be connected to the ground on the mainboard by several points to shield electromagnetic interference.

Besides, data cables of the LCD and the camera might introduce interference signals, which affect the receiving performance of the antenna. Thus, it is necessary to wrap conductive cloth around the two data cables and connected them to the ground.

RF cables of the antenna should be far from modules and components that might generate EMI, such as chip and memory, power interface, and data cable interface. The wiring of RF cables should be close to the ground of the mainboard.

During the layout and wiring of peripheral circuits, for the wiring of power and signal cables, keep a distance of 2 times of the line width, so as to effectively reduce the coupling between signals and keep a clean reflux path for the signal.

During the design of peripheral power circuits, the de-coupled capacitor should be placed closed to the module power PIN, the high-frequency high-speed circuit and the sensitive circuit should be placed far away from the border of PCB. They should better be separated during layout, so as to reduce the interference between them and protect the sensitive signal.

For the circuit or device on the side of system board that might interfere with the module, it should be shielded during design.

3.4.2. ESD Design Requirements

Module is embedded on the side of system board, so the user needs to make the ESD protection during design. For the key input/output signal interface, such as the (U)SIM card signal interface, the ESD device should be placed closely for protection. Besides, on the side of main board, the user should reasonably design the structure and PCB layout, guarantee that the metallic shielding shell is fully grounded, so as to leave a smooth discharge channel for ESD.

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3.5. Test Methods for Whole-Set Antenna OTA

Figure below is the diagram of OTA test system of CTIA. The system is mainly composed of test chamber, high-precision positioning system and its controller, Windows based PC running test software and RF test instruments with automatic test program. The main RF instruments are integrated RF test equipment, Spectrum Analyzer, Network Analyzer.

The radio equipments, Relay Switch Unit and PC with automatic test software are communicated via GPIB interface.

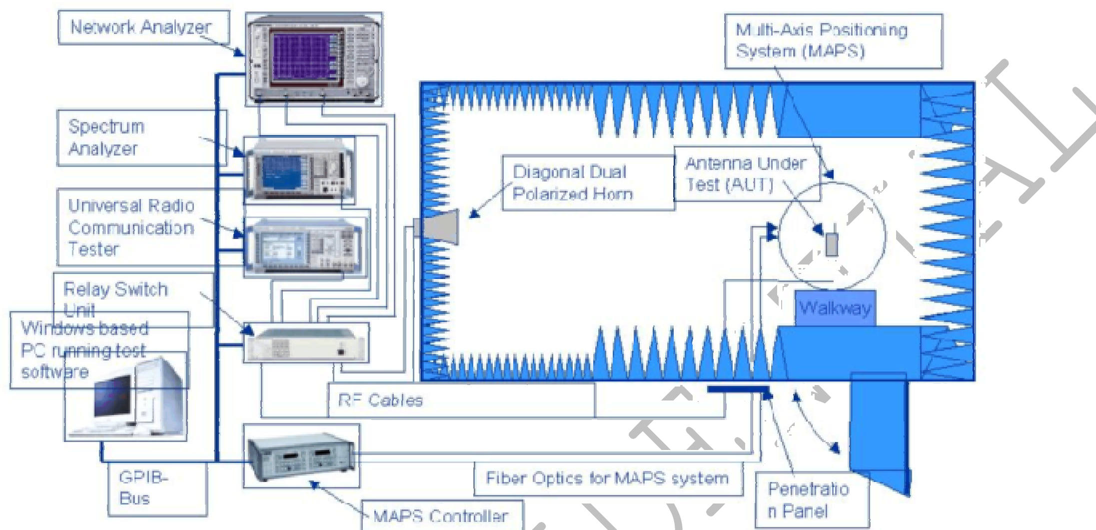

Figure 3-2 The OTA test system of CTIA

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4. Electrical, Reliability and Radio Characteristics

4.1. Absolute Maximum Ratings

Absolute maximum ratings for power supply and voltage on digital and analog pins of module are listed in the following table:

Table 4-1 Absolute Maximum Ratings

Parameter	Min	Max	Unit
V_BAT	-0.5	6.0	V
Peak current of V_BAT	0	2	A
Voltage at digital pin	-0.3	2.1	V
Voltage at ADC1	0.05	1.75	V
Voltage at ADC2	0.05	1.75	V

4.2. Operating Temperature

The operating temperature is listed in the following table.

Table 4-2 Operating Temperature

Parameter	Min	Typ.	Max	Unit
Normal Temperature	-30	25	75	℃
Storage Temperature	-40		85	℃

NOTE:

[1] When the module works within the temperature range, the deviations from the RF specification may occur. For example, the frequency error or the phase error would increase.

4.3. Current Consumption

The values of current consumption in different operating mode are shown below.

Table 4-3 Averaged standby DC power consumption [1]

Parameter	Condition	Typical Value	Unit
OFF state	Power down	45	
Sleep	All system is halted	1.5	

Table 4-4 Averaged standby DC power consumption [2]

Parameter	Condition	Typical Value				Unit
Bandwidth		**5MHz**	**10MHz**	**15MHz**	**20MHz**	
LTE	LTE FDD Band 1, Pout=23dBm	550	560	590	600	mA
	LTE FDD Band 3, Pout=23dBm	500	520	580	590	mA
	LTE TDD Band 38 ,Pout=23dBm	380	390	430	450	mA
	LTE TDD Band 39 ,Pout=23dBm	300	310	360	390	mA
	LTE TDD Band 40, Pout=23dBm	350	360	400	430	mA
	LTE TDD Band 41, Pout=23dBm	380	390	430	450	mA

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Table 4-5 Averaged standby DC power consumption [3]

Parameter	Condition	Typical Value	Unit
WCDMA	Band1 ,Pout=24dBm	550	mA
TD-SCDMA	Band34, Pout=24dBm	180	mA
	Band39, Pout=24dBm	180	mA
CDMA	BC0, Pout=23dBm	600	mA
GSM	Band3, Pout=30dBm	200	mA
	Band8, Pout=33dBm	300	mA

4.4. RF Output Power

The following table shows the RF output power of ME3630 module.

Table 4-6 Conducted RF Output Power

Frequency	Max	Min
LTE FDD Band 1	23dBm ±2.7dB	<-39dBm
LTE FDD Band 3	23dBm ±2.7dB	<-39dBm
LTE TDD Band38	23dBm ±2.7dB	<-39dBm
LTETDD Band 39	23dBm ±2.7dB	<-39dBm
LTE TDD Band40	23dBm ±2.7dB	<-39dBm
LTE TDD Band 41	23dBm ±2.7dB	<-39dBm
WCDMA Band1	24+1/-3 dBm	<-50dBm
TD-SCDMA Band34	24+1/-3 dBm	<-50dBm
TD-SCDMA Band39	24+1/-3 dBm	<-50dBm
CDMA BC0	23~30 dBm	<-50dBm
GSM Band3	30dBm ±2dB	<-50dBm
GSM Band8	33dBm ±2dB	<-50dBm

4.5. RF Receiving Sensitivity

The following table shows the conducted RF receiving sensitivity of ME3630 module.

Table 4-7 Conducted RF Receiving Sensitivity [1]

Band	5 MHz(dBm)	10 MHz(dBm)	20 MHz(dBm)
LTE FDD Band 1	-100 dBm	-97 dBm	-94 dBm
LTE FDD Band 3	-97 dBm	-94dBm	-91dBm
LTE TDD Band 38	-100 dBm	-97 dBm	-94 dBm
LTE TDD Band 39	-100 dBm	-97 dBm	-94 dBm
LTE TDD Band 40	-100 dBm	-97 dBm	-94 dBm
LTE TDD Band 41	-100 dBm	-97 dBm	-94 dBm

Table 4-8 Conducted RF Receiving Sensitivity [2]

Band	Sensitivity
WCDMA Band1	-107 dBm
TD-SCDMA BAND34	-108 dBm
TD-SCDMA BAND39	-108 dBm

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CDMA BC0	-104 dBm
GSM Band3	-102 dBm
GSM Band8	-102 dBm

4.6. GNSS Technical Parameters

The following table shows the GNSS techinical parameters of ME3630 module.

Table 4-9 GNSS Technical Parameters

GNSS (GPS/GLONASS)	Technical specification
GPS Frequency	1575.42±1.023 MHz
Tracking sensitivity	-155dbm
Cold-start sensitivity	-143dbm
Accuracy (Open Sky)	2meter
TTFF (Open Sky)	Hot start: 4s
	Cold start: 55s
Receiver Type	Qualcomm GPS Gen8C
GPS L1 Frequency	1575.42MHz
Update rate	2-4 HZ
GNSS (GPS/GLONASS) data format	ZTE Loc API/ZTE auto-negotiation
GNSS (GPS/GLONASS) Current consumption	65mA
GNSS (GPS/GLONASS) antenna	Passive/Active antenna

4.7. Electrostatic Discharge

The module is not protected against electrostatics discharge (ESD) in general. Consequently, it is subject to ESD handling precautions that typically apply to ESD sensitive components. Proper ESD handling and packaging procedures must be applied throughout the processing, handling and operation of any application that incorporates the module.

The following table shows the module electrostatics discharge characteristics.

Table 4-10 ESD

Tested Points	**Contact discharge**	**Air Discharge**	**Unit**
V_BAT	± 5	± 10	kV
All antenna interfaces	± 4	± 8	kV
Other interfaces	± 0.5	± 1	kV

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5. Mechanical Dimensions

This chapter describes the mechanical dimensions of the module. All dimensions are measured in mm.

5.1. Mechanical Dimensions of the Module

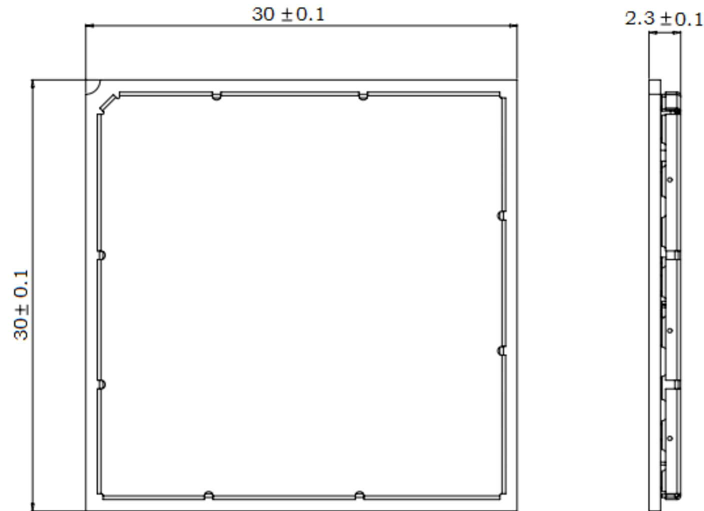

Figure 5-1 ME3630 Top and Side Dimensions

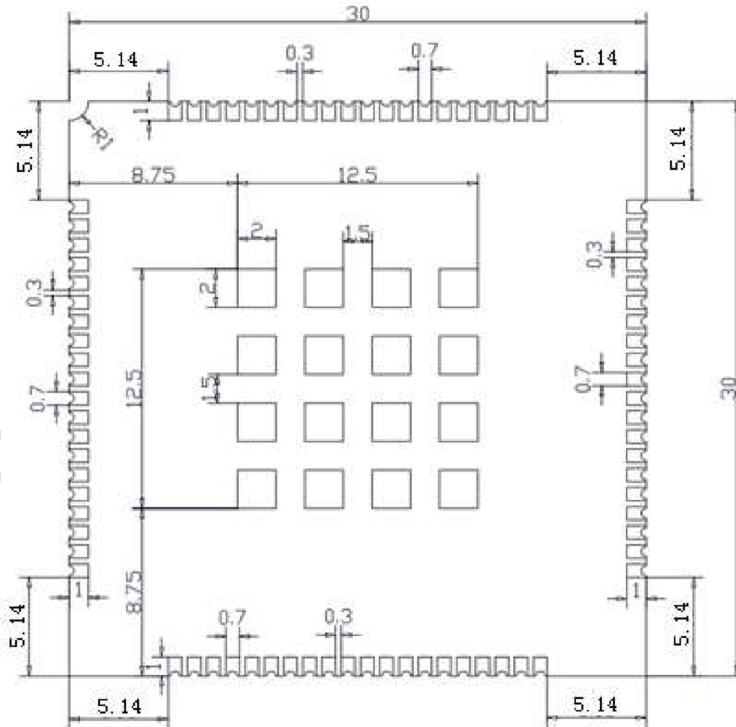

Figure 5-2 ME3630 Bottom Dimensions (Bottom view)

5.2. Footprint of Recommendation

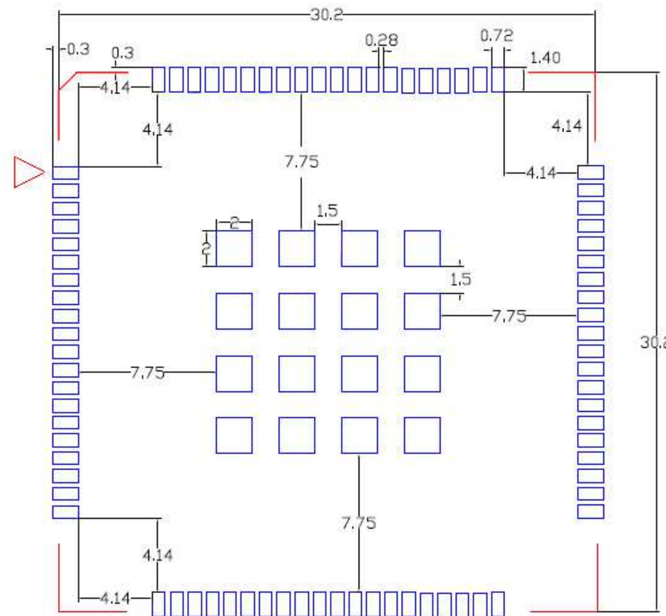

Figure 5-3 Recommended Footprint (Top view)

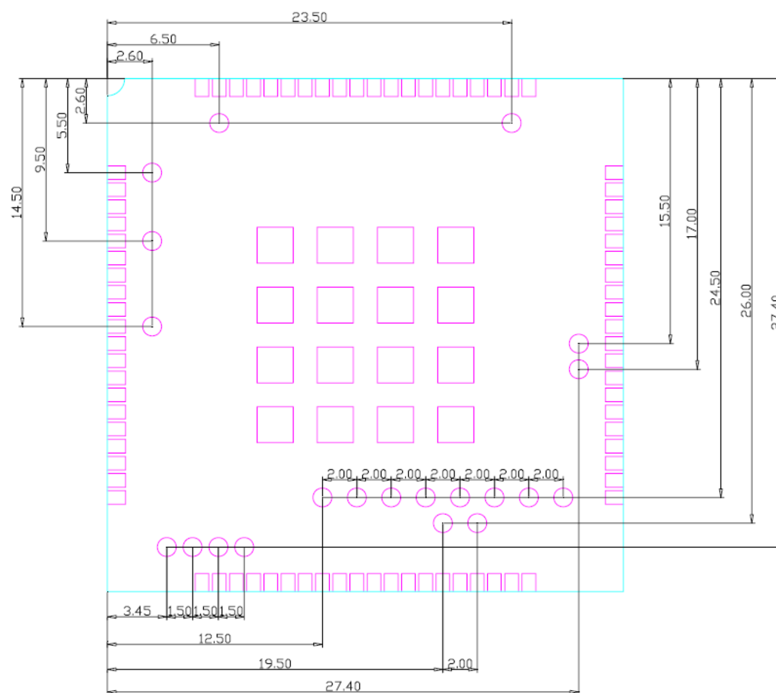

Figure 5-4 Location and dimension of test points

NOTE:

1. Keep out the area below the test point (circular area on the above figure) in the host PCB.

2. In order to maintain the module, keep about 3mm between the module and other components in the host PCB.

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5.3. Top View of the Module

Figure 5-5 Top View of the Module

5.4. Bottom View of the Module

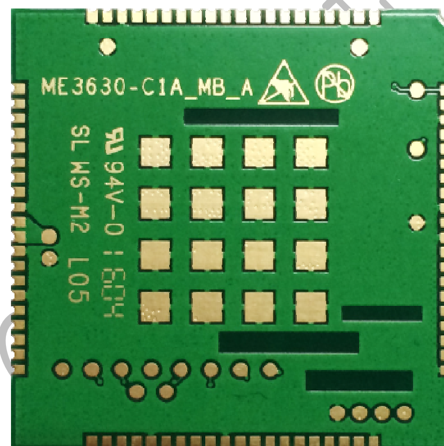

Figure 5-6 Bottom View of the Module

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6. Related Test & Test Standard

6.1. Testing Reference

The related tests of MODULE comply with the IEC standard, including the equipment running under high/low temperature, storage under high/low temperature, temperature shock and EMC. Table 6-1 is the list of testing standard, which includes the related testing standards for MODULE.

Table 6-1 Testing Standard

NOTE:

- **IEC: International Electro technical Commission;**
- **GB/T: Recommended national standard**

Test Standard	Document Reference
IEC6006826	Environmental testing-Part2.6: Test FC: Sinusoidal Vibration
IEC60068234	Basic environment testing procedures part2.
IEC60068264	Environmental testing-part2-64: Test FH: vibration, broadband random and guidance.
IEC60068214	Environmental testing-part 2-14: Test N: change of temperature
IEC60068229	Basic environmental testing procedures-part2: Test EB and guidance.
IEC6006822	Environmental testing-part2-2: Test B:dry heat
IEC6006821	Environment testing-part2-1: Test A: cold.
GB/T 15844.2	MS telecommunication RF wireless phone-set environment requirement & experimental method – part 4: Strict level of experimental condition
GB/T 2423.17	Basic environment experiment of electronic products-Experiment Ka: Salt mist experiment method
GB/T 2423.5	Basic environment experiment of electronic products-Part2: Experiment method Try Ea & Introduction: Shock
GB/T 2423.11	Basic environment experiment of electronic products-Part2: Experiment method Try Fd: Broad frequency band random vibration (General requirement)
TIA/EIA 603 3.3.5	TIA Standard-part3-5:Shock Stability

6.2. Description of Testing Environment

The working temperature range of MODULE is divided into the normal working temperature range and the extreme working temperature range. Under the normal working temperature range, the testing result of RF complies with the requirements of 3GPP specifications, and its function is normal. Under the extreme temperature range, the RF index basically complies with the 3GPP specifications, and the quality of data communication is affected to a certain extent, but its normal function is not affected. MODULE has passed the EMC test. Table 6-2 is the requirement for the testing environment, and Table 6-3 lists out the instruments and devices that might be used during the test.

WARNING: Table 6-2 lists the extreme working conditions for the Module. Using the Module beyond these conditions may result in permanent damage to the module.

Table 6-2 Testing Environment

Working Condition	Min Temperature	Max Temperature	Remark
Normal working condition	-30°C	75°C	All the indexes are good.
Extreme working condition	-40~ -30°C	75~85°C	Some indexes become poorer.
Storage	-40°C	85°C	Storage environment of module

Table 6-3 Testing Instrument & Device

Testing Item	Instrument & Device
RF test	Comprehensive testing device
	RF cable
	Tower antenna
	Microwave darkroom
High/Low-temperature running & storage test	High/Low-temperature experimental box
Temperature shock test	Temperature shock experimental box
Vibration test	Vibration console

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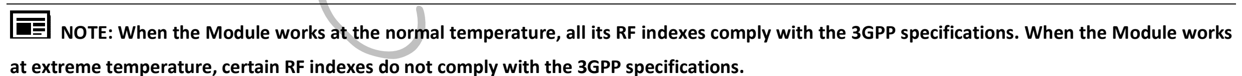
6.3. Reliability Testing Environment

The reliability test includes the vibration test, high/low-temperature running, high/low-temperature storage and temperature shock experiment test. Refer to **Table 6-4** for the specific parameters.

Table 6-4 Reliability Features

Test Item	Test Condition	Test Standard
Random vibration	Frequency range: 5-20Hz, PSD: 1.0m2/s3 Frequency range: 20-200Hz, -3dB/oct 3 axis, 1 hour for each axis	IEC 68-2-6
Temperature shock	Low temperature: -40°C ± 2°C High temperature: +80°C ± 2°C Temperature changing period: less than 30s Test duration: 2 hours Cycle: 10	IEC 68-2-14 Na
High-temperature running	Normal high temperature: 75 °C Extreme high temperature: 85°C Duration: 24 hours	ZTE standard
Low-temperature running	Normal low temperature: -30°C Extreme low temperature: -40°C Duration: 24 hours	ZTE standard
High temperature & high humidity	Temperature: +60°C Humidity: 95% Duration: 48 hours	ZTE standard
High temperature storage	Temperature: 85°C Duration: 24 hours	IEC 68-2-1 Ab
Low temperature storage	Temperature: -40°C Duration: 24 hours	IEC 68-2-2 Bb



NOTE: When the Module works at the normal temperature, all its RF indexes comply with the 3GPP specifications. When the Module works at extreme temperature, certain RF indexes do not comply with the 3GPP specifications.

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7. SMT Process and Baking Guide

This chapter describes module's storage, PAD design, SMT process parameters, baking requirements, etc., and it is applicable for the process guide to second-level assembly of LCC encapsulation module.

7.1. Storage Requirements

Storage conditions: temperature<40℃, relative humidity<90% (RH), 12 months weld ability guaranteed under this circumstances of excellent sealing package.

The Moisture sensitivity level for all modules is level 3 (Conforming to IPC/JEDEC J-STD-020). After opening the package, mount within 168 hours under the environment conditions of temperature<30℃, relative humidity<60% (RH). If it doesn't meet the above requirements, perform the baking process. See the baking parameters in Table below:

Table 7-1 Baking parameters

Temperature	Baking conditions	Baking time	Remarks
125± 5℃	Moisture: ≤60%RH	8 hours	The accumulated baking time must be less than 96 hours
45± 5℃	Moisture: ≤5%RH	192 hours	

The product's transportation, storage and processing must conform to IPC/JEDEC J-STD-033

When in the process of PAD designing of module, refer to IPC-SM-782A and the chapter 6.2 below.

7.2. Module Plainness Standard

Plainness of the module is required to be less than 0.15mm.

Measurement method: put the module on the marble plane, use the feeler gage to measure the gap width at the position of maximum warp, and do not exert force on the module during the measurement.

7.3. Process Routing Selection

The modules are manufactured with the lead-free process and meet the ROHS requirements, therefore it's recommended to follow the lead-free manufacturing process upon the selection of process routing for module board and main board.

7.3.1. Solder Paste Selection

The solder pastes with metal particle TYPE3 and TYPE4 can fulfill the welding requirements. It is accordingly recommended to use the no-clean solder paste. If the solder paste which needs cleaning is used, we cannot guarantee the components on the module board could withstand the washing of the cleaning solvents. This might cause the functional problems of such components and affect the appearance of the module. During the printing process, make sure the solder paste's thickness at the position of module's PAD is within 0.18mm~0.20mm.

7.3.2. Design of module PAD's steel mesh opening on main board

The thickness of the steel mesh on main board is selected according to the encapsulation type of components on the main board. Pay attention to the following requirements:

Make sure to design the module PAD on main board according to chapter 5.

The thickness of steel mesh is 0.15mm or 0.18mm, but the thickness at the position of module pad can be increased to 0.18~0.20mm or the thickness of steel mesh is directly 0.18mm~0.20mm on main board.

Requirements on the thickness of solder paste: control the thickness between 0.18mm and 0.20mm.

See the LCC module PAD's steel mesh opening in the following table:

Table 7-2 LCC module PAD's steel mesh opening

Module PAD GAP (G)=Center Distance (e) – PAD width (X)	Steel mesh opening

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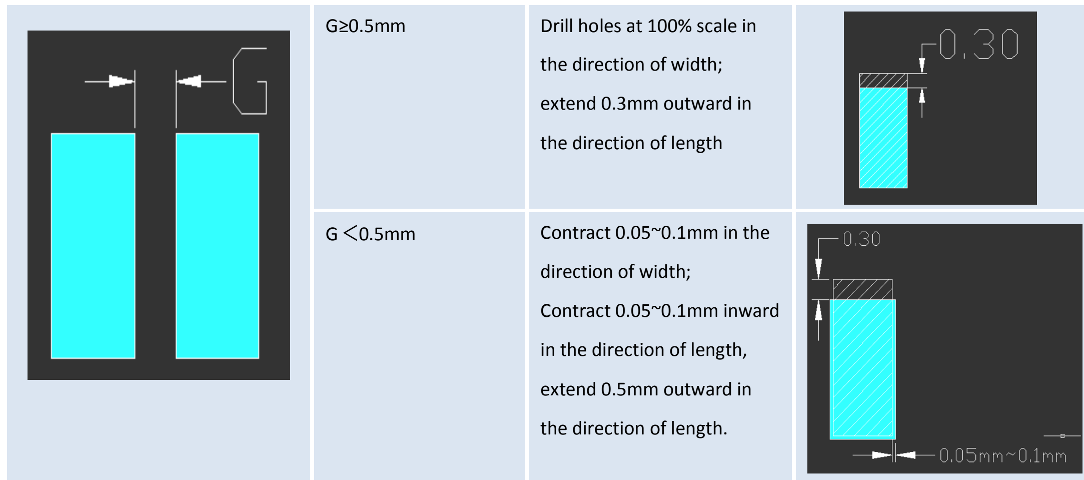


	G≥0.5mm	Drill holes at 100% scale in the direction of width; extend 0.3mm outward in the direction of length	
	G＜0.5mm	Contract 0.05~0.1mm in the direction of width; Contract 0.05~0.1mm inward in the direction of length, extend 0.5mm outward in the direction of length.	

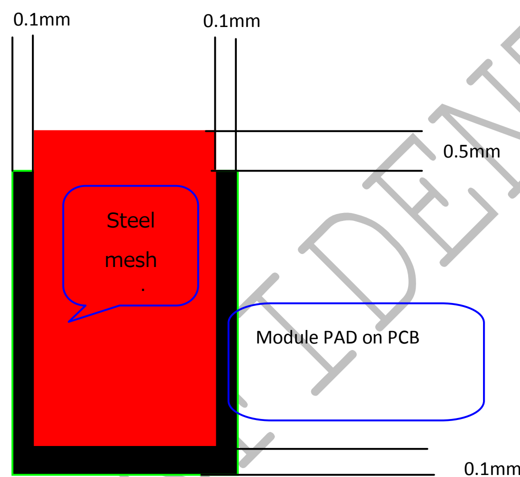


Figure 7-1 Module Board’s Steel Mesh Diagram

7.3.3. Module Board’s SMT process

1) SMT Tape Reel:

The tape reels, which are suitable for SMT, have been made for most ZTE modules. If the module has provided the tape reel itself and meets the SMT requirements, customers can directly use it for module SMT.

Figure 7-2 Material Module Pallet

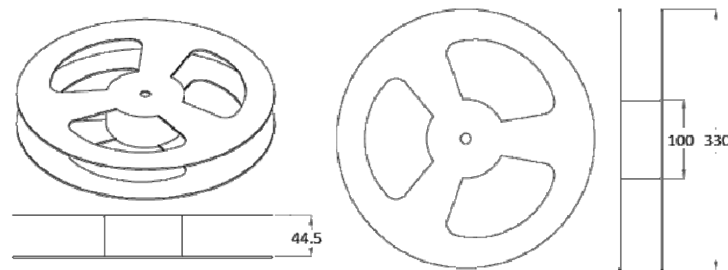
NOTE: Figure7-3 is just for reference, it doesn’t represent the actual Material Module Tape Reel.

Otherwise, customers need make a loading tool similar to the tape reel. Customers can take out the module from the packaging box, put them into the tape according to the sequence and direction, and then start SMT.

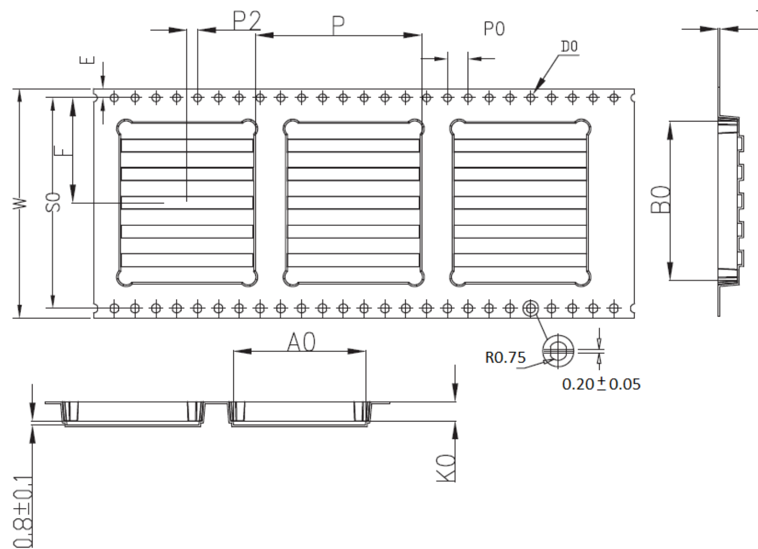
2) Tape Reel Dimension (unit: mm):

The following picuture is the tape reel specific dimension for your reference:

A: Whole dimension:



B: Detailed dimension:



ITEM	W	A0	B0	K0	K1	P	F	E	S0	D0	D1	P0	P2	T
DIM	$44.00^{+0.30}_{-0.30}$	$25.50^{+0.15}_{-0.15}$	$30.50^{+0.15}_{-0.15}$	$3.80^{+0.15}_{-0.15}$	$0.00^{+0.00}_{-0.00}$	$32.00^{+0.10}_{-0.10}$	$20.20^{+0.15}_{-0.15}$	$1.75^{+0.10}_{-0.10}$	$40.40^{+0.10}_{-0.10}$	$1.50^{+0.10}_{-0.00}$	$0.00^{+0.00}_{-0.00}$	$4.00^{+0.10}_{-0.10}$	$2.00^{+0.10}_{-0.10}$	$0.35^{+0.05}_{-0.05}$
ALTERNATE														

Figure 7-3 Tape Reel Dimension

3） Mounting Pressure:

In order to ensure a good contact between the module and the solder paste on main board, the pressure of placing the module board on main board should be 2-5N according to our experiences. Different modules have different numbers of pads, therefore the pressure selected are different. Customers can select proper pressure based on their own situations to suppress the module paste as little as possible, in order to avoid the surface tension of the solder paste melts too much to drag the module during reflow.

7.3.4. Module Soldering Reflow Curve

Module soldering furnace temperature curve is:

- Peak value: 245+0/-5℃
- ≥217℃: 30～～60S
- 150～200℃: 60～～120S
- Temperature rise slope: <3℃/S
- Temperature drop rate: －2～－4℃/S

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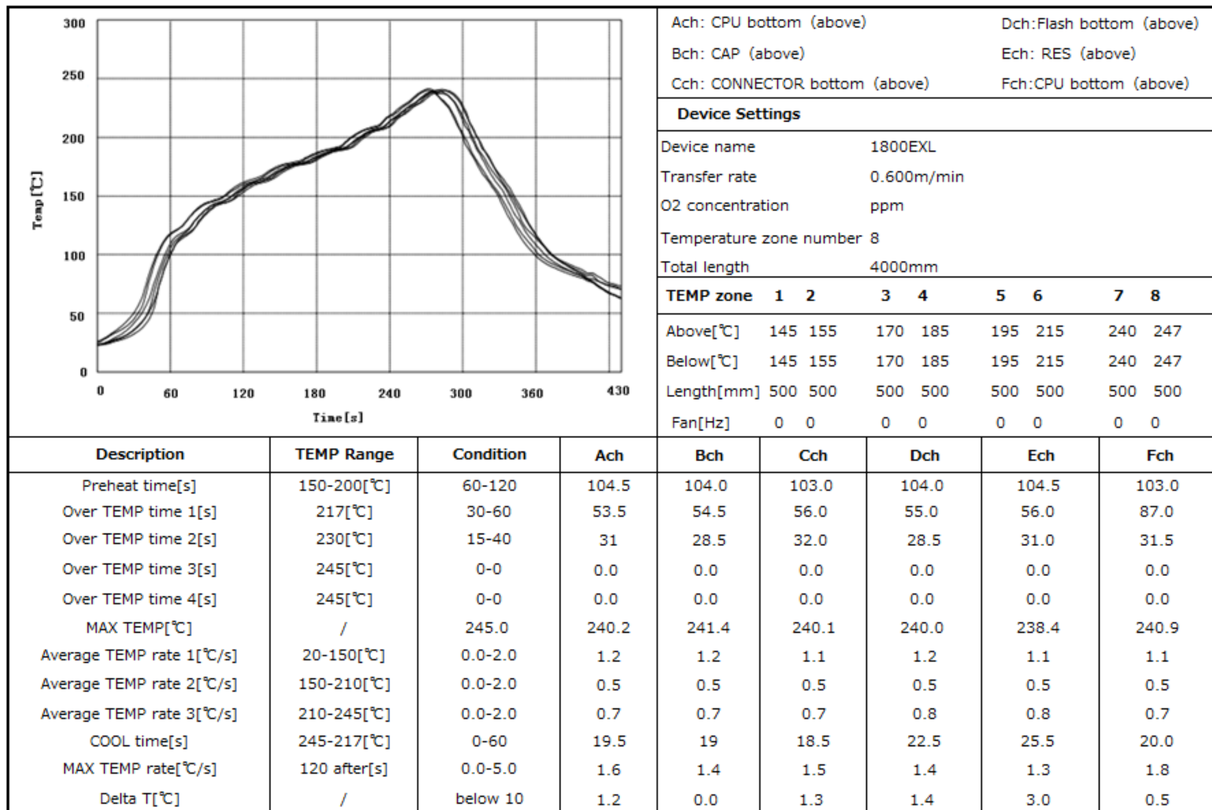
NOTE: The test board of furnace temperature must be the main board with the module board mounted on, and there must be testing points at the position of module board.



Ach: CPU bottom (above)
Bch: CAP (above)
Cch: CONNECTOR bottom (above)
Dch: Flash bottom (above)
Ech: RES (above)
Fch: CPU bottom (above)

Device Settings

Device name	1800EXL
Transfer rate	0.600m/min
O2 concentration	ppm
Temperature zone number	8
Total length	4000mm

TEMP zone	1	2	3	4	5	6	7	8
Above[℃]	145	155	170	185	195	215	240	247
Below[℃]	145	155	170	185	195	215	240	247
Length[mm]	500	500	500	500	500	500	500	500
Fan[Hz]	0	0	0	0	0	0	0	0

Description	TEMP Range	Condition	Ach	Bch	Cch	Dch	Ech	Fch
Preheat time[s]	150-200[℃]	60-120	104.5	104.0	103.0	104.0	104.5	103.0
Over TEMP time 1[s]	217[℃]	30-60	53.5	54.5	56.0	55.0	56.0	87.0
Over TEMP time 2[s]	230[℃]	15-40	31	28.5	32.0	28.5	31.0	31.5
Over TEMP time 3[s]	245[℃]	0-0	0.0	0.0	0.0	0.0	0.0	0.0
Over TEMP time 4[s]	245[℃]	0-0	0.0	0.0	0.0	0.0	0.0	0.0
MAX TEMP[℃]	/	245.0	240.2	241.4	240.1	240.0	238.4	240.9
Average TEMP rate 1[℃/s]	20-150[℃]	0.0-2.0	1.2	1.2	1.1	1.2	1.1	1.1
Average TEMP rate 2[℃/s]	150-210[℃]	0.0-2.0	0.5	0.5	0.5	0.5	0.5	0.5
Average TEMP rate 3[℃/s]	210-245[℃]	0.0-2.0	0.7	0.7	0.7	0.8	0.8	0.7
COOL time[s]	245-217[℃]	0-60	19.5	19	18.5	22.5	25.5	20.0
MAX TEMP rate[℃/s]	120 after[s]	0.0-5.0	1.6	1.4	1.5	1.4	1.3	1.8
Delta T[℃]	/	below 10	1.2	0.0	1.3	1.4	3.0	0.5

Figure 7-4 Module Furnace Temperature Curve Reference Diagram

7.3.5. Reflow Method

If the main board used by customers is a double-sided board, it is recommended to mount the module board at the second time. In addition, it is preferable for the main board to reflow on the mesh belt when mounting at the first time and the second time. If such failure is caused by any special reason, the fixture should be also used to make such main board reflow on the track so as to avoid the deformation of PCB during the reflow process.

7.3.6. Maintenance of Defects

If poor welding occurs to the module board and main board, e.g., pseudo soldering of the module board and main board, the welder can directly use the soldering iron to repair welding according to the factory's normal welding parameters.

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7.4. Module's Baking Requirements

The module must be baked prior to the second reflow.

7.4.1. Module's Baking Environment

The operators must wear dust-free finger cots and anti-static wrist strap under the lead-free and good static-resistant environment. Refer to the following environment requirements:

The product's transportation, storage and processing must conform to IPC/JEDEC J-STD-033.

7.4.2. Baking device and operation procedure

Baking device: Any oven where the temperature can rise up to 125°C or above.

Precautions regarding baking: during the baking process, the modules should be put in the high-temperature resistant pallet flatly and slightly to avoid the collisions and frictions between the modules. During the baking process, do not overlay the modules directly because it might cause damage to the module's chipset.

7.4.3. Module Baking Conditions

See the baking parameters in **Table 7-1.**

8. Federal Communication Commission Interference 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.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution:

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This

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equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

This device is intended only for OEM integrators under the following conditions:

1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and the maximum antenna gain allowed for use with this device is 4.8 dBi.
2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed

IMPORTANT NOTE: In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: “Contains FCC ID:SRQ-ME3630”. The grantee's FCC ID can be used only when all FCC compliance requirements are met.

Manual Information To the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user’s manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

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