	Re-acquisition		-157.5		dBm
	Tracking		-168		dBm
Sensitivity GPS(L1)+GLONASS+BD	Autonomous acquisition (cold start)		-148		dBm
	Re-acquisition		-158		dBm
	Tracking		-168		dBm
Sensitivity GPS(L1)+BD	Autonomous acquisition (cold start)		-148		dBm
	Re-acquisition		-157.5		dBm
	Tracking		-166		dBm
Receiver	Channels		L1:47		
	Update rate		1	10	Hz
	Tracking L1, CA code				
	Protocol support NMEA, PAIR				
Power consumption With GPS (L1) +GALILEO+BEIDOU	Acquisition		10.85		mA
	Continuous tracking		10.33		mA
	Sleep current		113		uA
	RTC current		36		uA

4.4. GNSS Antenna Requirements

Table 45: Recommended Antenna Characteristics (GNSS)

Passive	Recommended standard
Operating band	L1: 1559~1609MHZ
Direction	Hemisphere, face to sky
Input impedance	50 ohm
Maximum input power	50W
VSWR	<2
Plan category	RHCP or Linear
Passive antenna gain	0dBi
Active antenna gain	-2dBi
Active antenna noise figure	<1.5
Built-in antenna LNA gain	20dB(Typ.)
Total antenna gain	<18 dB
Coaxial insertion loss	<1.5dB

4.5. Antenna Reference Design

4.5.1. Passive Antenna for LTE/GNSS

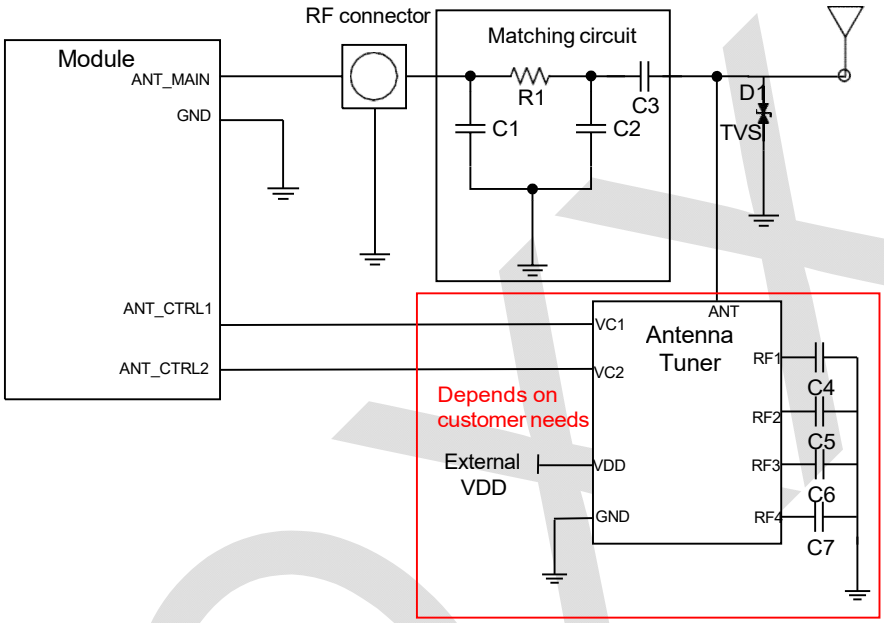

Figure 27: Passive antenna reference

In above figure, the component R1/C1/C2/C3 is reserved for antenna matching, the value of components can only be acquired after the antenna tuning, usually provided by the antenna factory. Among them, R1 paste 0Ω, C3 paste 100pF, C1 and C2 do not paste by default. The component D1 is a Bidirectional ESD Protection device, which is suggested to add to protection circuit, the recommended Part Numbers of the TVS for RF main antenna and GNSS antenna are listed in the following table:

The Pins 42 and 43 is reserved for the Antenna tuner which depends on custermer actual needs. If the cus tomer needs to use antenna tuner,please refer to the design document "Antenna Tuning Reference Design "for detailed design.

Table 46: TVS for RF main antenna part number list

Manufacturer	Part Number	V_{RWM}	V_{cmax}	C_{Jmax}	Package
BilLSEMI	BLE5V0CR05UB	5V	40V	0.05pF	DFN1006-2L

Table 47: TVS for GNSS antenna part number list

Manufacturer	Part Number	V_{RWM}	$V_{C}max$	$C_{J}max$	Package
WAYON	WE05DGCF-B	5V	23V	0.3pF	DFN1006-2L

4.5.2. Active Antenna for GNSS

If active antenna is used, there should be an external power supply. Reference design is shown as bellow:

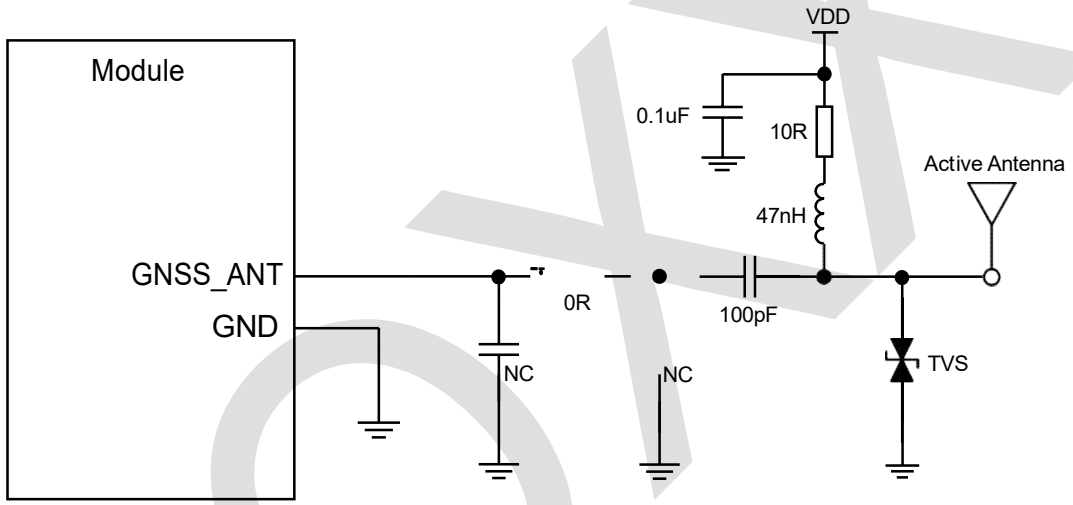

Figure 28: Active antenna reference

4.6. PCB layout

When routing the PCB, users should pay attention to the impedance design of the trace from the module's ANT port to the antenna connector on the PCB, controlling the impedance at 50Ω. The trace length is recommended to be kept within 20mm and should stay away from interference signals such as power supply and clock signals.

If using an IPEX connector, ensure impedance control by leaving the projection area hollow and using a reference layer.

If using an SMA connector, ensure impedance control by keeping the distance between the RF signal pad edge and the GND copper foil sufficiently far, at least 1.2mm

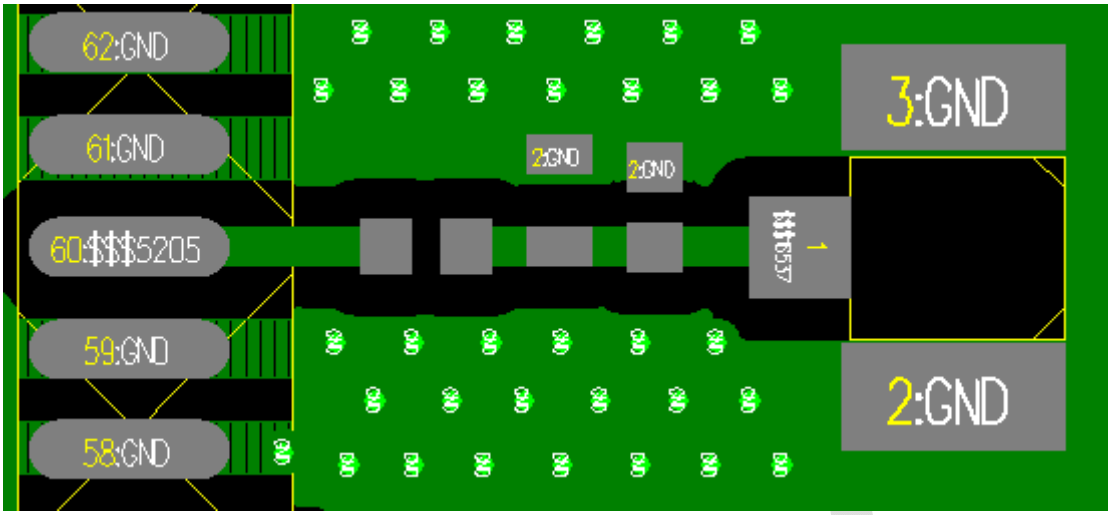

Figure 29: Reference PCB Layout for IPEX Connector

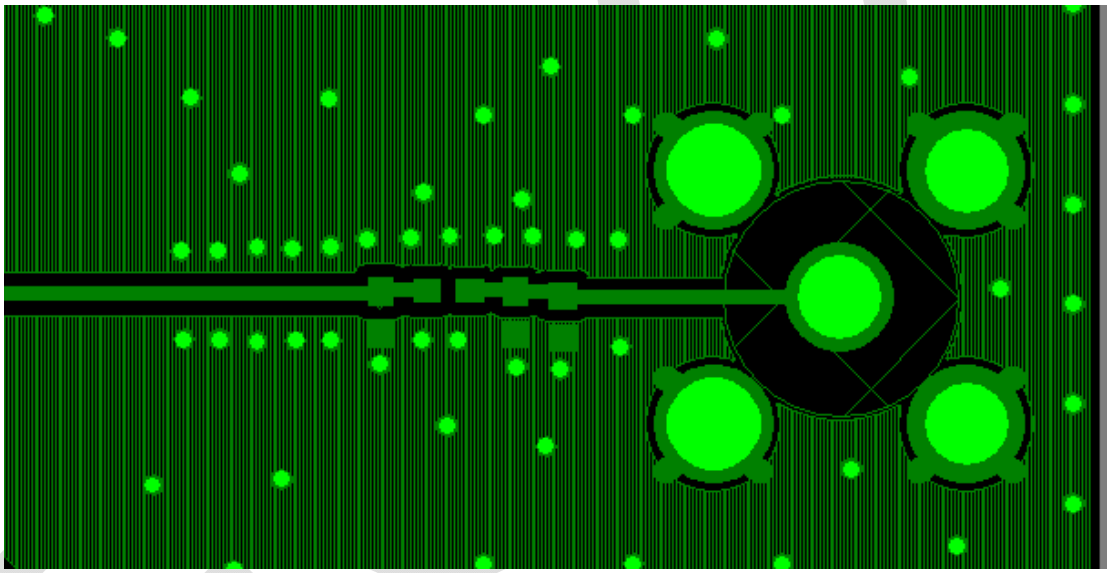

Figure 30: Reference PCB Layout for SMA Connector

5. Electrical Specifications

5.1. Absolute maximum ratings

Absolute maximum rating for digital and analog pins of IQ10 are listed in the following table, exceeding these limits may cause permanent damage to the module.

Table 48: Absolute maximum ratings

Parameter	Min.	Typ.	Max.	Unit
Voltage on VBAT	-0.3	-	4.5	V
Voltage on VBUS	-0.3	-	5.4	V
Voltage at digital pins (GPIO, I2C, UART, PCM)	-0.3	-	2.0	V
Voltage at I/O pins	-0.3	-	2.0	V
(USIM)	-0.3	-	3.3	V
Voltage at PWRKEY	-0.3	-	4.5	V
Voltage at RESET	-0.3	-	3.6	V

5.2. Operating conditions

Table 49: Recommended operating ratings

Parameter	Min.	Typ.	Max.	Unit
Voltage at VBAT	3.4	3.8	4.2	V
Voltage at VBUS	3.3	5.0	5.2	V

Table 50: 1.8V Digital I/O characteristics*

Parameter	Description	Min.	Typ.	Max.	Unit
V_{IH}	High-level input voltage	0.7 * VCC	1.8	VCC + 0.2	V
V_{IL}	Low-level input voltage	-	0	0.2 * VCC	V
V_{OH}	High-level output voltage	0.8 * VCC	-	-	V

V_{OL}	Low-level output voltage	0	-	0.15 * VCC	V
I_{OH}	High-level output current (no pull down resistor)	-	-	-	mA
I_{OL}	Low-level output current (no pull up resistor)	-	-	-	mA
I_{IH}	Input high leakage current (no pull-down resistor)	-10	-	10	uA
I_{IL}	Input low leakage current (no pull up resistor)	-10	-	10	uA

NOTE

These parameters are for digital interface pins, such as GPIO, I2C, UART and PCM.

The operating temperature of IQ10 is listed in the following table.

Table 51: Operating temperature

Parameter	Min.	Typ.	Max.	Unit
Normal operation temperature	-30	25	75	℃
Extended operation temperature*	-40		85	℃
Storage temperature	-40		90	℃

NOTE

When Module is within the extended operation temperature range, Module is able to establish and maintain data transmission, SMS, etc. The performance may deviate slightly from the 3GPP specifications, but will meet 3GPP specifications again when the temperature returns to normal operating temperature levels. It is strongly recommended that customers take heat dissipation measures to ensure that the normal operating temperature of the module can't be exceeded.

5.3. Operating Mode

5.3.1. Operating Mode Definition

The table below summarizes the various operating modes of IQ10 product.

Table 52: Operating mode Definition

Mode		Function
Normal operation	LTE Sleep	AT command “AT+CSCLK=1” can be used to set the module to sleep mode. In this case, the current consumption of module will be reduced to the minimal level and the module can still receive paging message and SMS.
	LTE Idle	Software is active. Module is registered to the network, and the module is ready to communicate.
	LTE Data transmission	There is data transmission in progress. In this case, power consumption is related to network settings (e.g., power control level); uplink/downlink data rates, etc.
Minimum functionality mode		AT command ‘AT+CFUN=0 AT+CSCLK=1’ can be used to set the module to a minimum functionality mode without removing the power supply. In this mode, the RF part of the module will not work and the USIM card will not be accessible, but the serial port and USB port are still accessible. The power consumption in this mode is lower than normal mode.
Flight mode		AT command ‘AT+CFUN=4’ can be used to set the module to flight mode without removing the power supply. In this mode, the RF part of the module will not work, but the serial port and USB port are still accessible. The power consumption in this mode is lower than normal mode.
PSM mode		AT command ‘AT+CPSMS’ can be used to set the module to PSM mode without removing the power supply. In this mode, the CPU is powered off, only the clock circuit inside the module works, the network is not connected, and the serial port and USB are unavailable. In this case, the power consumption of the module is reduced to the minimum.
Power off		Module will go into power off mode by sending the AT command ‘AT+CPOF’ or pull down the PWRKEY pin, normally. In this mode the power management unit shuts down the power supply, and software is not active. The serial port and USB are not accessible.

5.3.2. Sleep mode

In sleep mode, the current consumption of module will be reduced to the minimal level.
Both hardware and software should meet several conditions simultaneously so that IQ10 will enter into sleep mode:

- USB condition: Send ‘AT+CSCLK=1’ and unplug USB.
- Software condition: Software must support sleep mode configuration.

- UART condition: Send 'AT+CSCLK=1'.

NOTE

Before designing, please pay attention to how to realize sleeping/waking function and refer to document [17] for more details.

5.3.3. Minimum functionality mode and Flight mode

Minimum power consumption mode ceases a majority function of Module, to enable the module enter the minimum power consumption mode, the following hardware and software conditions must be followed:

(1) Module is in normal mode.
(2) Send AT command "AT+CFUN=0".
(3) Send AT command "AT+CSCLK=1".
(4) DTR pin pulled to high level and VBUS disconnect.

This mode is set by the AT command which provides a choice of the functionality levels.

- AT+CFUN=0: Minimum functionality
- AT+CFUN=1: Full functionality (Default)
- AT+CFUN=4: Flight mode

If IQ10 has been set to minimum functionality mode, the RF function and SIM card function will be closed. In this case, the serial port and USB are still accessible, but RF function and SIM card will be unavailable.
If IQ10 has been set to flight mode, the RF function will be closed. In this case, the serial port and USB are still accessible, but RF function will be unavailable.
When IQ10 is in minimum functionality or flight mode, it can return to full functionality by the AT command "AT+CFUN=1".

5.3.4. PSM mode

The PSM mode can be set by "AT+CPSMS", and it can minimize the current consumption.

The module is initially in the RRC connect state, and it will enter idle mode after disconnecting RRC Connect by "end call", while the timer T3324/T3412 starts timing. After the timer T3324 expires, the module enters the PSM mode. The module will wake up automatically after the timer T3412 expiring, and it will enter TAU mode.
The AT command for entering the PSM mode are as follows:
AT$QCPMUCFG=1,4 //Set PMU Deep sleep mode

AT$QCPSMR=1 //Open PSM reporting URC AT+CEREG?
AT+CPSMS=1,,,"01011111","00000001" //Enable PSM Mode, Set T3412_ext and T3324
AT+CEREG?//Query network status

After entering the PSM mode, the module will terminate the network connection, and unable to respond to requests. Customers can send AT command when the timer T3412 expiring, or wake up the module by PWRKEY/DTR/VBUS. The module will exit the PSM mode by “AT+CPSMS=0”.

5.4. Current Consumption

The current consumption is listed in the table below.

Table 53: Current consumption on VBAT Pins (VBAT=3.8V)

LTE sleep/Idle mode			
LTE supply current (GNSS off, without USB connection)	Idle mode Typical: 4.4mA Sleep mode@DRX=0.32S Typical: 1.42mA Sleep mode@DRX=0.64S Typical: 786uA Sleep mode@DRX=1.28S Typical: 597uA		
PSM mode			
PSM supply current	PSM_Hib mode Typical: 2.8uA		
Minimum functionality mode			
AT+CFUN=0, AT+CSCLK=1 (GNSS non-standalone mode)	Typical: 139uA (with simcard) Typical: 147uA (without simcard)		
AT+CFUN=0, AT+CSCLK=1 (GNSS off)	Typical: 70uA (with simcard) Typical: 78uA (without simcard)		
LTE Cat1			
LTE-FDD B1	@10MHz	23dBm	Typical :501mA
LTE-FDD B2	@10MHz	23dBm	Typical :563mA
LTE-FDD B3	@10MHz	23dBm	Typical :500mA
LTE-FDD B4	@10MHz	23dBm	Typical :532mA
LTE-FDD B5	@10MHz	23dBm	Typical :503mA
LTE-FDD B7	@10MHz	23dBm	Typical :587mA
LTE-FDD B8	@10MHz	23dBm	Typical :501mA
LTE-FDD B12	@10MHz	23dBm	Typical :543mA
LTE-FDD B13	@10MHz	23dBm	Typical :522mA
LTE-FDD B18	@10MHz	23dBm	Typical :461mA
LTE-FDD B19	@10MHz	23dBm	Typical :470mA
LTE-FDD B20	@10MHz	23dBm	Typical :469mA

LTE-FDD B25	@10MHz	23dBm	Typical :563mA
LTE-FDD B26	@10MHz	23dBm	Typical :504mA
LTE-FDD B28	@10MHz	23dBm	Typical :476mA
LTE-FDD B66	@10MHz	23dBm	Typical :526mA
LTE-TDD B34	@10MHz	23dBm	Typical :390mA
LTE-TDD B38	@10MHz	23dBm	Typical :472mA
LTE-TDD B39	@10MHz	23dBm	Typical :423mA
LTE-TDD B40	@10MHz	23dBm	Typical :472mA
LTE-TDD B41	@10MHz	23dBm	Typical :451mA

Table 54: Standalone GNSS current consumption on VBAT Pins (VBAT=3.8V, CAT1 OFF)

Mode	Condition	Typical (mA)
GPS (L1)	-130dBm/Tracking	9.74
	-145dBm/Tracking	9.72
	-130dBm/Cold start	9.73
	-145dBm/Cold start	9.32
	Loss of lock	9.30
GPS (L1) +GLONASS	-130dBm/Tracking	10.51
	-145dBm/Tracking	10.90
	-130dBm/Cold start	10.66
	-145dBm/Cold start	10.02
	Loss of lock	9.64
GPS (L1) +BEIDOU	-130dBm/Tracking	10.01
	-145dBm/Tracking	10.48
	-130dBm/Cold start	11.01
	-145dBm/Cold start	10.48
	Loss of lock	10.36
Real network active antenna GPS (L1) +GALILEO+BEIDOU	Outdoor search	10.92
	Acquisition	10.18
	Loss of lock	9.96
Real network active antenna GPS (L1)	Outdoor search	8.86
	Acquisition	7.56
	Loss of lock	8.64

Table 55: Standalone GNSS low power mode current consumption on VBAT Pins (VBAT=3.8V, CAT1 OFF)

Mode	Condition	Typical
AT+CGNSSSLEEP	GPS (L1) +GALILEO+BEIDOU	70 uA
AT+CGNSSFITNESS=1	GPS (L1)	7.56 mA
	GPS (L1) +GALILEO+BEIDOU	10.2 mA

AT+CGNSSGLP=1	Only GPS (L1) support	3.08mA
AT+CGNSSFLP=1	Duty cycle 90%	9.90 mA
	Duty cycle 75%	8.95 mA
	Duty cycle 50%	6.42 mA
	Duty cycle 25%	43.93 mA
	Duty cycle 10%	2.67mA
AT+CGNSSALP=1		4.71mA
AT+CGNSSALP=2		8.85 mA
AT+CGNSSRTC=0	V_BACKUP=3.3V, software RTC	13 uA
	V_BACKUP=3.3V, hardware RTC	36 uA

5.5. ESD Notes

IQ10 is sensitive to ESD in the process of storage, transporting, and assembling. When IQ10 is mounted on the customers' mother board, the ESD components should be placed beside the connectors which human body may touch, such as SIM card holder, audio jacks, switches, keys, etc. The following table shows the IQ10 ESD measurement performance.

Table 56: The ESD performance measurement table (Temperature: 25℃, Humidity: 45%)

Part	Contact discharge	Air discharge
VBAT, GND	+/-4K	+/-8K
Antenna port	+/-4K	+/-8K
USB interface	+/-4K	+/-6K
UART interface	+/-3K	+/-6K
Other PADs	+/-1K	+/-2K

NOTE

Test conditions:

- The external of the module has surge protection diodes and ESD protection diodes.
- The data in table above were tested using EVB.

6. SMT Production Guide

6.1. Top and Bottom View of IQ10

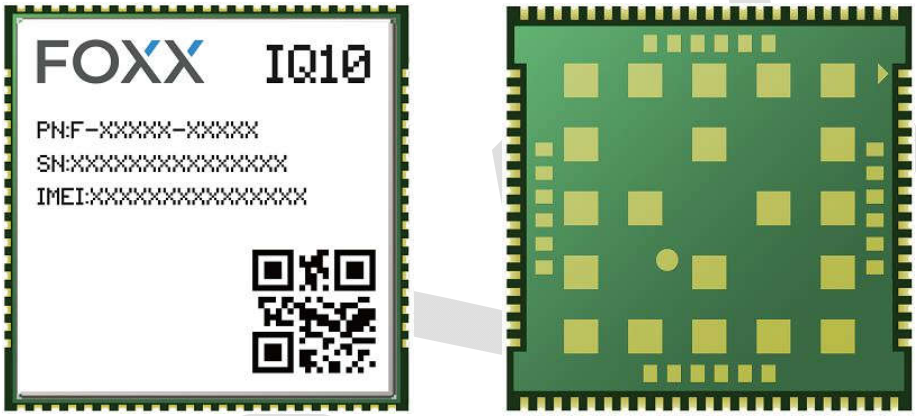

Figure 31: Top and bottom view of IQ10

NOTE

The above is the design effect diagram of the module for reference. The actual appearance is subject to the actual product.

6.2. Label Information

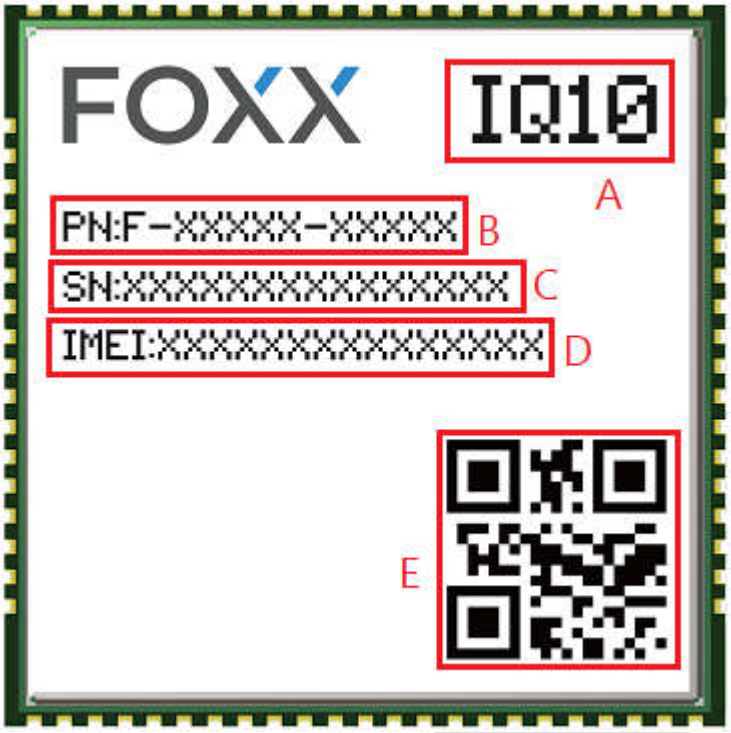

Figure 32: Label information for IQ10

Table 57: The description of label information

No.	Description
A	Project name
B	Part number
C	Serial number
D	IMEI number
E	QR code

6.3. Recommended PCB Footprint

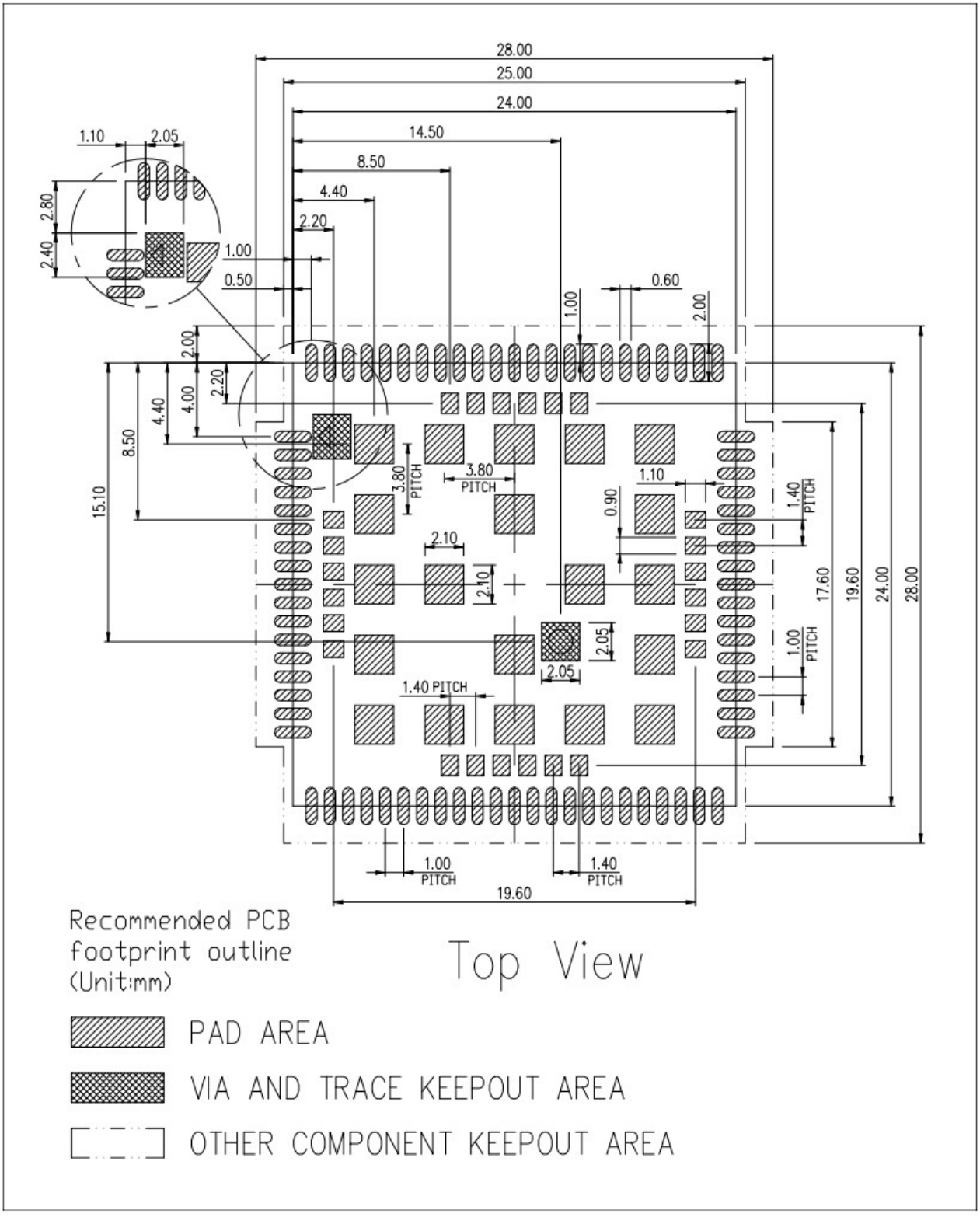

Figure 33: Footprint recommendation (Unit: mm)

6.4. Recommend Stencil Size

Recommend stencil thickness 0.15mm.

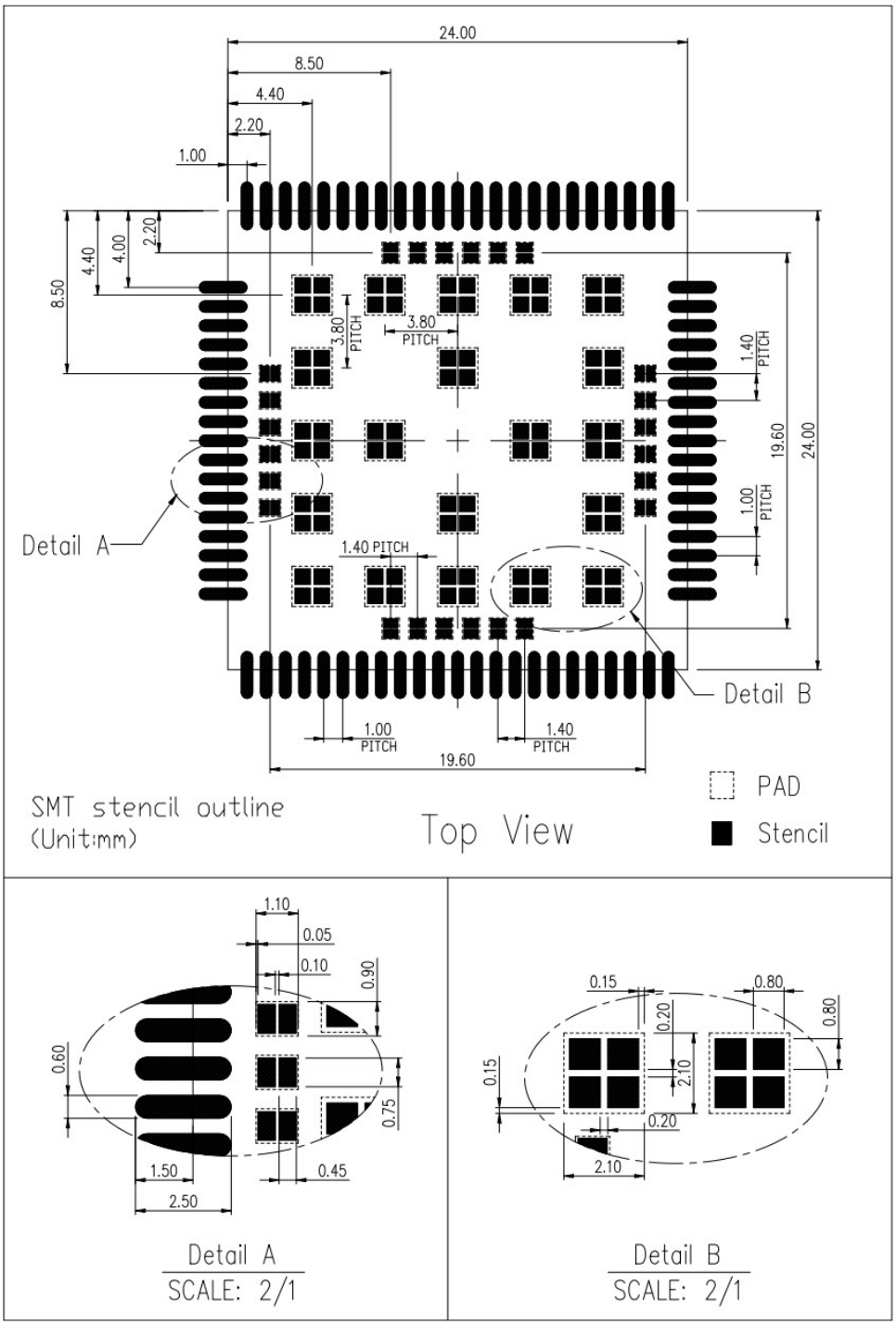

Figure 34: Recommend stencil dimension (Unit: mm)

6.5. Typical SMT Reflow Profile

It is recommended to lead free.
During the furnace temperature test, the thermocouple test point should be connected to the module position to ensure that the module position reaches the required temperature. Recommended furnace temperature profile (lead-free SMT reflow) is as follows:

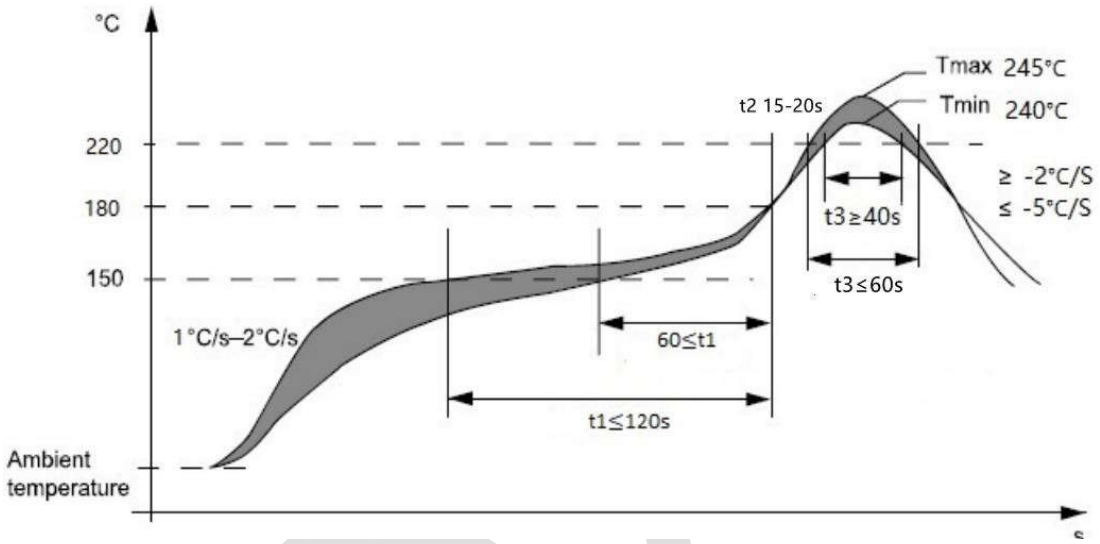

Figure 35: Recommended reflow furnace temperature curve (lead-free)

Table 58: The main board reflux temperature curve requirements (lead-free)

Temperature range	Time	Critical parameter
Preheating zone (room temperature~150 ℃)	NA	Temperature rise slope 1~2℃/S
T1(150~180℃)	60-120S	/
T2(180-220℃)	15-20S	/
T3(≥220℃)	40-60S	Peak temperature 240~245℃
Cooling Zone	NA	Cooling slope -2~-5℃/S

NOTE

- The maximum times of refluxes for the module is once.
- Recommended lead-free process.
- In the table above, the temperature testing location includes the solder mask of the module MCU pins, bottom LGA pins, and external LCC pins.
- The actual welding temperature is affected by other external factors, such as the presence of furnace

carriers, solder paste, size and thickness of the substrate, and component resistance. Thermal requirements and panel design, etc. Please confirm with our engineering and technical personnel in time if the recommended parameters cannot be reached. Otherwise, the module may be damaged.

- For boards with thickness less than 1.2mm, it is recommended to use board supported by furnace carrier or materials with high Tg to prevent warping and PCB when heated. Deformation, thus affecting module welding. For modules larger than 35.0 mm *35.0 mm and 5G products, it is recommended to use the furnace carrier to pass through the furnace to reduce the cause of the bottom plate and mold. Due to the difference of Tg value of block, the phenomenon of unbalanced thermal stress appears in the process of high temperature welding reflow, resulting in the defect rate of virtual welding and little tin.
- After the module is welded, X-ray and optical inspection methods shall be used to check the welding quality. For specific standards, please refer to relevant standards of IPC-A-610H.
- For more information about shipping and manufacturing, please refer to *Module Secondary SMT Process User Guide.*
- Due to the complexity of the SMT process, in case of uncertainty or processes not mentioned in this document (such as selective wave soldering, ultrasonic welding), please contact support team before SMT process starts.

6.6. Moisture Sensitivity Level (MSL)

The modules are shipped in vacuum-sealed aluminum foil bag bags, vacuum packaging according to IPC/JEDEC standard J-STD-020C specification。

- Recommended storage conditions: The temperature is 23℃ ± 5℃, and the relative humidity is 35% to 60%.
- Storage period (sealed vacuum packaging): Under recommended storage conditions, the storage period is 12 months.

The module meets the humidity sensitivity level 3, and the storage period after unpacking is shown in table below.

The out-of-bag floor life of the module with MSL-3 is 168 hours. If the workshop temperature is 23℃±5℃ and the relative humidity is less than 60%, the module needs to be unpacked within 168 hours of reflux production or other high temperature operations. Otherwise, the module shall be stored in an environment with relative humidity less than 10% (for example, a moisture-proof cabinet) to keep the product dry.

Table 59: Moisture Sensitivity Level

MSL	Out-of-bag floor life	Comment
1	Unlimited	≤+30℃/85% RH
2	1 year	≤+30℃/60% RH
2a	4 weeks	
3	168 hours	
4	72 hours	

5	48 hours	
5a	24 hours	
6	Mandatory bake before use. After bake, it must be reflowed within the time limit specified on the label.	

Before using, it is necessary to confirm whether the package is in good condition. After unpacking, check the status of humidity indicator card in vacuum bag (Figure 36). The module needs to be baked before use if any of the following conditions occur.

- Explanation Humidity indicator card: 30%, 40%, and 50% of any indicator circle has discolouring
- The module has been un-packed and the module exceeds the humidity sensitivity level corresponding to the exposed workshop time. For example, MSL=3 is 168.
- Packed，but the Shelf Life exceeds 12 months；
- Exceeds the Floor Life；
- Unable to track and determine the status of the module;

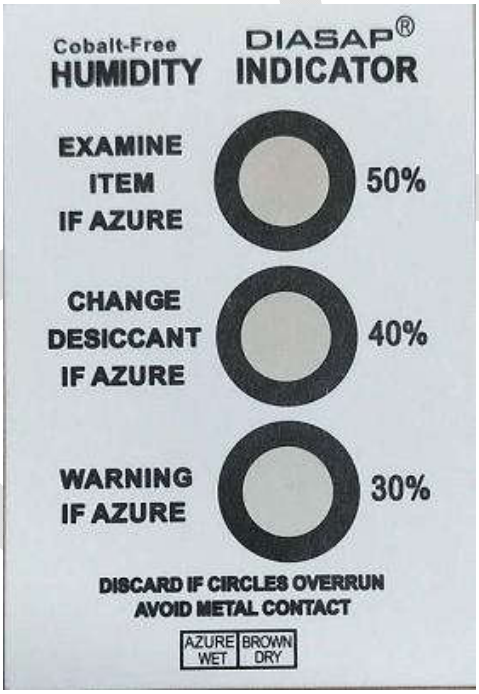

Figure 36: Humidity card

The following conditions also need to be pre-baked.

- The storage temperature and humidity do not meet the recommended storage conditions.
- Vacuum sealed bag leak, bulk materials
- Before repairing the module.
- After unpacking, the module failed to complete production or storage under the control of humidity sensitive level 3.

6.7. Baking Requirements

If baking is required, proceed according to the requirements in the table below. Preferentially choose a nitrogen-filled oven.

Table 60: Module baking requirements

Baking conditions	Baking time	Comment
120℃±5℃, <5% RH	8 hours	Not applicable to original packaging pallets

NOTE

- In order to prevent and reduce the occurrence of poor welding caused by moisture, such as foaming and delamination, the module should be strictly controlled. It is not recommended to expose the module to air for a long time after unpacking the vacuum package。
- Before baking, it is necessary to remove the module from the package and place the bare module on the high temperature resistant device to avoid high temperature damage to the plastic tray or coil; The modules for secondary baking must be welded within 24 hours after baking, otherwise they need to be stored in vacuum packaging or in a drying oven.
- Please pay attention to ESD protection when unpacking and placing modules, such as wearing anti-static gloves.

7. Packaging

IQ10 module support tray packaging.

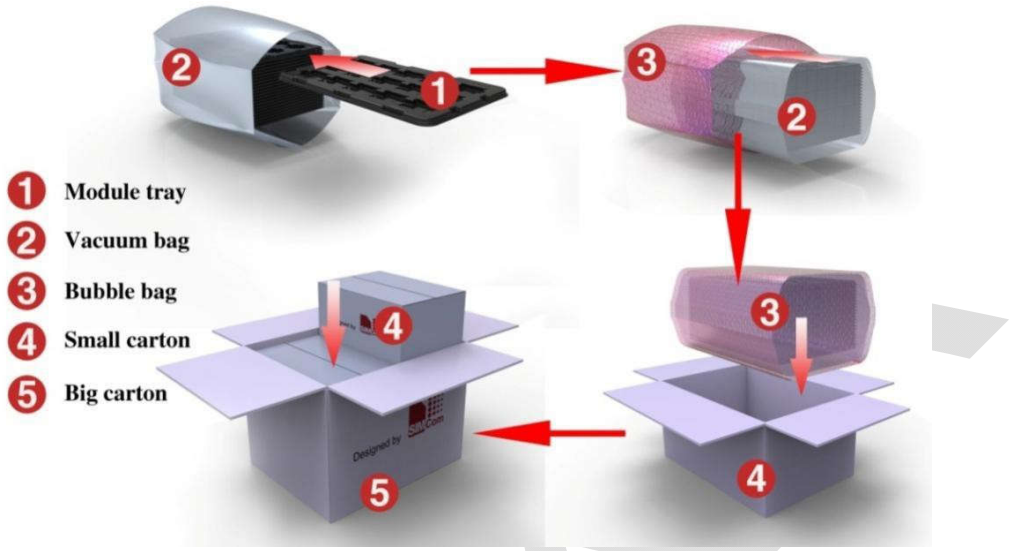

Figure 37: Packaging diagram

Module tray drawing:

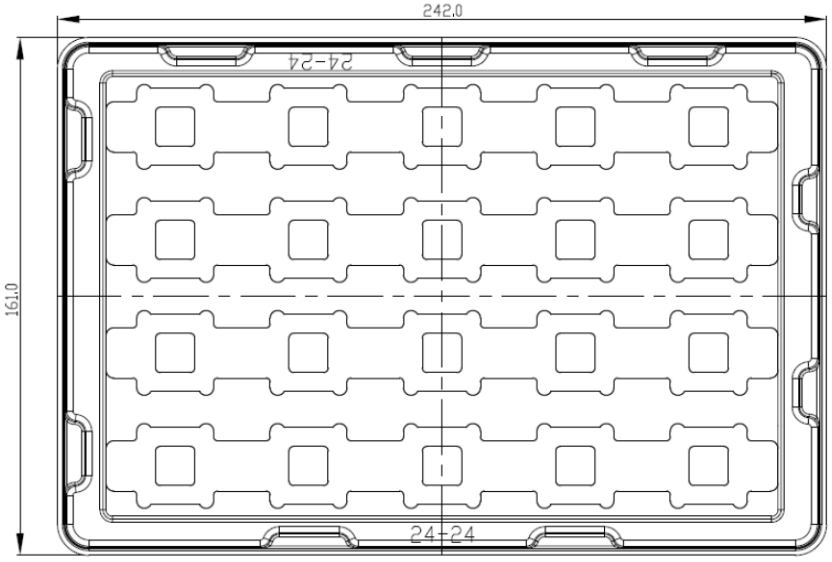

Figure 38: Tray drawing

Table 61: Tray size

Length (±3mm)	Width (±3mm)	Module number
242.0	161.0	20

Small carton drawing:

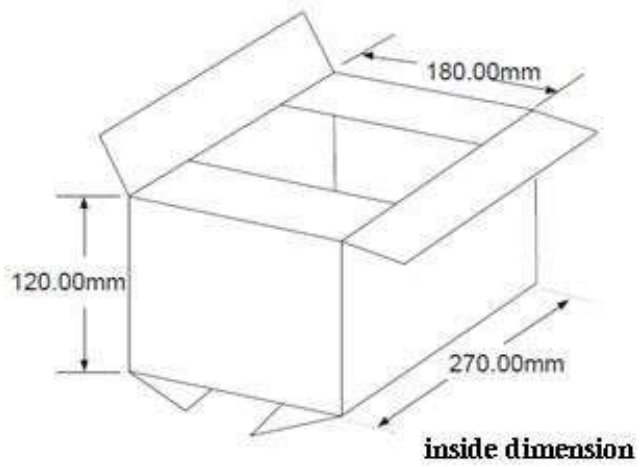

Figure 39: Small carton drawing

Table 62: Small Carton size

Length (±10mm)	Width (±10mm)	Height (±10mm)	Module number
270	180	120	20*20=400

Big carton drawing:

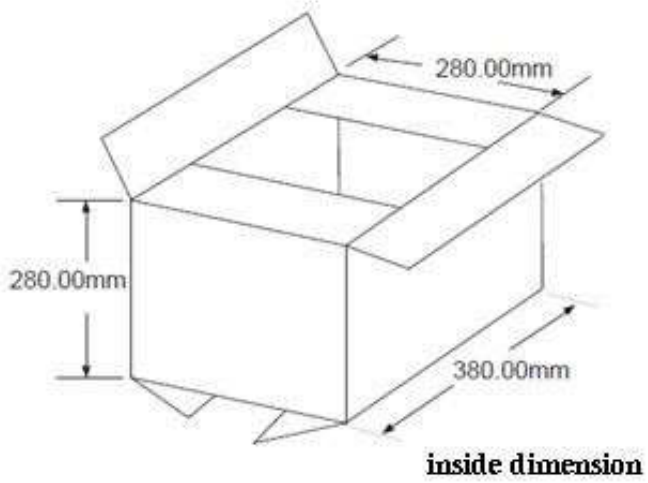

Figure 40: Big carton drawing

Table 63: Big Carton size

Length (±10mm)	Width (±10mm)	Height (±10mm)	Module number
380	280	280	400*4=1600

8. Appendix

8.1. Coding Schemes and Maximum Net Data Rates over Air Interface

Table 64: Coding Schemes and Maximum Net Data Rates over Air Interface

LTE-FDD device category (Downlink)	Max data rate (peak)	Modulation type
Category Cat 1	10Mbps	QPSK/16QAM/64QAM
LTE-FDD device category (Uplink)	**Max data rate (peak)**	**Modulation type**
Category Cat 1	5Mbps	QPSK/16QAM

8.2. Related Documents

Table 65: Related Documents

NO.	Title	Description
[1]	IQ10 Series_AT Command Manual	AT Command Manual.
[2]	ITU-T Draft new recommendationV.25ter	Serial asynchronous automatic dialing and control.
[3]	3GPP TS 51.010-1	Digital cellular telecommunications system (Release 5); Mobile Station (MS) conformance specification.
[4]	3GPP TS 34.124	Electromagnetic Compatibility (EMC) for mobile terminals and ancillary equipment.
[5]	3GPP TS 34.121	Electromagnetic Compatibility (EMC) for mobile terminals and ancillary equipment.
[6]	3GPP TS 34.123-1	Technical Specification Group Radio Access Network; Terminal conformance specification; Radio transmission and reception (FDD).

[7]	3GPP TS 34.123-3	User Equipment (UE) conformance specification; Part 3: Abstract Test Suites.
[8]	EN 301 908-02 V2.2.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS) and User Equipment (UE) for IMT-2000. Third Generation cellular networks; Part 2: Harmonized EN for IMT-2000, CDMA Direct Spread (UTRA FDD) (UE) covering essential requirements of article 3.2 of the R&TTE Directive.
[9]	EN 301 489-24 V1.2.1	Electromagnetic compatibility and Radio Spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 24: Specific conditions for IMT-2000 CDMA Direct Spread (UTRA) for Mobile and portable (UE) radio and ancillary equipment.
[10]	IEC/EN60950-1(2001)	Safety of information technology equipment (2000).
[11]	3GPP TS 51.010-1	Digital cellular telecommunications system (Release 5); Mobile Station (MS) conformance specification.
[12]	GCF-CC V3.23.1	Global Certification Forum - Certification Criteria.
[13]	2002/95/EC	Directive of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS).
[14]	Module Secondary SMT Process User Guide	Module secondary SMT Guidelines.
[15]	IQ10 Series_UART_Application Note	This document describes how to use UART interface of modules.
[16]	Antenna design guidelines for diversity receiver system	Antenna design guidelines for diversity receiver system.
[17]	IQ10 Series_Sleep Mode_Application Note	Sleep Mode Application Note.
[18]	IQ10 Series_UIM HOT SWAP_Application Note	This document introduces UIM card detection and UIM hot swap.
[19]	Module Secondary SMT Process User Guide	This paper mainly introduces the SMT process of module production, the requirements of steel mesh production, reflow welding, welding and repair.

8.3. Terms and Abbreviations

Table 66: Terms and Abbreviations

Abbreviation	Description
ADC	Analog-to-Digital Converter
ARP	Antenna Reference Point
BER	Bit Error Rate
BD	BeiDou
BTS	Base Transceiver Station
CS	Coding Scheme
CSD	Circuit Switched Data
CTS	Clear to Send
DAC	Digital-to-Analog Converter
DSP	Digital Signal Processor
DTE	Data Terminal Equipment (typically computer, terminal, printer)
DTR	Data Terminal Ready
DTX	Discontinuous Transmission
DAM	Downloadable Application Module
DPO	Dynamic Power Optimization
EFR	Enhanced Full Rate
EGSM	Enhanced GSM
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
ETS	European Telecommunication Standard
FCC	Federal Communications Commission (U.S.)
FD	SIM fix dialing phonebook
FDMA	Frequency Division Multiple Access
FR	Full Rate
GMSK	Gaussian Minimum Shift Keying
GNSS	Global Navigation Satellite System
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global Standard for Mobile Communications
HR	Half Rate
I2C	Inter-Integrated Circuit
IMEI	International Mobile Equipment Identity
LTE	Long Term Evolution
MO	Mobile Originated
MS	Mobile Station (GSM engine), also referred to as TE

MT	Mobile Terminated
NMEA	National Marine Electronics Association
PAP	Password Authentication Protocol
PBCCH	Packet Switched Broadcast Control Channel
PCB	Printed Circuit Board
PCS	Personal Communication System, also referred to as GSM 1900
RF	Radio Frequency
RMS	Root Mean Square (value)
RTC	Real Time Clock
SIM	Subscriber Identification Module
SMS	Short Message Service
SMPS	Switched-mode power supply
TDMA	Time Division Multiple Access
TE	Terminal Equipment, also referred to as DTE
TX	Transmit Direction
UART	Universal Asynchronous Receiver & Transmitter
VSWR	Voltage Standing Wave Ratio
EDGE	Enhanced data rates for GSM evolution
ZIF	Zero intermediate frequency
WCDMA	Wideband Code Division Multiple Access
VCTCXO	Voltage control temperature-compensated crystal oscillator
SIM	Universal subscriber identity module
UMTS	Universal mobile telecommunications system
UART	Universal asynchronous receiver transmitter
PSM	Power saving mode
FD	SIM fix dialing phonebook
LD	SIM last dialing phonebook (list of numbers most recently dialed)
MC	Mobile Equipment list of unanswered MT calls (missed calls)
ON	SIM (or ME) own numbers (MSISDNs) list
RC	Mobile Equipment list of received calls
SM	SIM phonebook
NC	Not connect

8.4. Safety Caution

Table 67: Safety Caution

Marks	Requirements
	When in a hospital or other health care facility, observe the restrictions about the use of mobiles. Switch the cellular terminal or mobile off, medical equipment may be sensitive and not operate normally due to RF energy interference.
	Switch off the cellular terminal or mobile before boarding an aircraft. Make sure it is switched off. The operation of wireless appliances in an aircraft is forbidden to prevent interference with communication systems. Forgetting to think much of these instructions may impact the flight safety, or offend local legal action, or both.
	Do not operate the cellular terminal or mobile in the presence of flammable gases or fumes. Switch off the cellular terminal when you are near petrol stations, fuel depots, chemical plants or where blasting operations are in progress. Operation of any electrical equipment in potentially explosive atmospheres can constitute a safety hazard.
	Your cellular terminal or mobile receives and transmits radio frequency energy while switched on. RF interference can occur if it is used close to TV sets, radios, computers or other electric equipment.
	Road safety comes first! Do not use a hand-held cellular terminal or mobile when driving a vehicle, unless it is securely mounted in a holder for hands free operation. Before making a call with a hand-held terminal or mobile, park the vehicle.
	GSM cellular terminals or mobiles operating over radio frequency signals and cellular networks cannot be guaranteed to connect in all conditions, especially with a mobile fee or an invalid SIM card. While you are in this condition and need emergent help, please remember to use emergency calls. In order to make or receive calls, the cellular terminal or mobile must be switched on and in a service area with adequate cellular signal strength. Some networks do not allow for emergency call if certain network services or phone features are in use (e.g. lock functions, fixed dialing etc.). You may have to deactivate those features before you can make an emergency call. Also, some networks require that a valid SIM card be properly inserted in the cellular terminal or mobile.