

N77-GL

Product Specifications

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Notice

This document is specifically for N77-GL.

This document is intended for system engineers (SEs), development engineers, and test engineers.

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About This Document

Scope

This document is applicable to N77-GL.




Audience

This document is intended for system engineers (SEs), development engineers, and test engineers.

Change History

Issue	Date	Change	Changed By
1.0	2023-06	Initial draft	Li Xuzhe
1.1	2025-01	Adding CE&FCC warnings	Ben Li

Conventions

Symbol	Indication
	This warning symbol means danger. You are in a situation that could cause fatal device damage or even bodily damage.
	Means reader be careful. In this situation, you might perform an action that could result in module or product damages.
	Means note or tips for readers to use the module

1 Safety Recommendations

Please read carefully and strictly adhere to the following safety recommendations to ensure that the product complies with national and environmental requirements, and to avoid potential threats to personal safety and protect the product and work environment from damage:

- Do not use in areas where there is a risk of fire or explosion.

Using the product in areas with flammable gases, such as propane, gasoline, or combustible sprays, or dust, can result in explosions or fires.

- In places where wireless communication is prohibited, please turn off the wireless communication function.

If the product is used in medical institutions or on airplanes, electromagnetic waves emitted by this product may interfere with surrounding equipment.

Follow the requirements below in design and use of the application for this module:

- Do not disassemble the product without authorization, otherwise, the product's after-sales warranty service cannot be provided.
- Please design the product correctly according to the Hardware User Guide. Please connect the product to a stable power supply voltage, and the wiring should comply with safety and fire prevention management requirements.
- Avoid touching the pins of the module directly in case of damages caused by ESD.
- Do not insert or remove the USIM card or mobile storage card while the product is not turned off.

2 About N77-GL

N77-GL is an industry-grade cellular module that supports GSM/EDGE, WCDMA, FDD-LTE (Cat 4), and TDD-LTE (Cat 4).

2.1 Product Overview

Table 2-1 lists the variant and frequency bands that N77-GL supports.

Table 2-1 Supported frequency bands

Variant	Region	Category	Frequency band	GNSS
GL	Global	Cat4	FDD-LTE: B1, B2, B3, B4, B5, B7, B8, B12, B13, B17, B18, B19, B20, B26, B28, B66 TDD-LTE: B34, B38, B39, B40, B41 WCDMA: B1, B2, B5, B8 GSM/EDGE: 850/900/1800/1900 MHz	Not supported

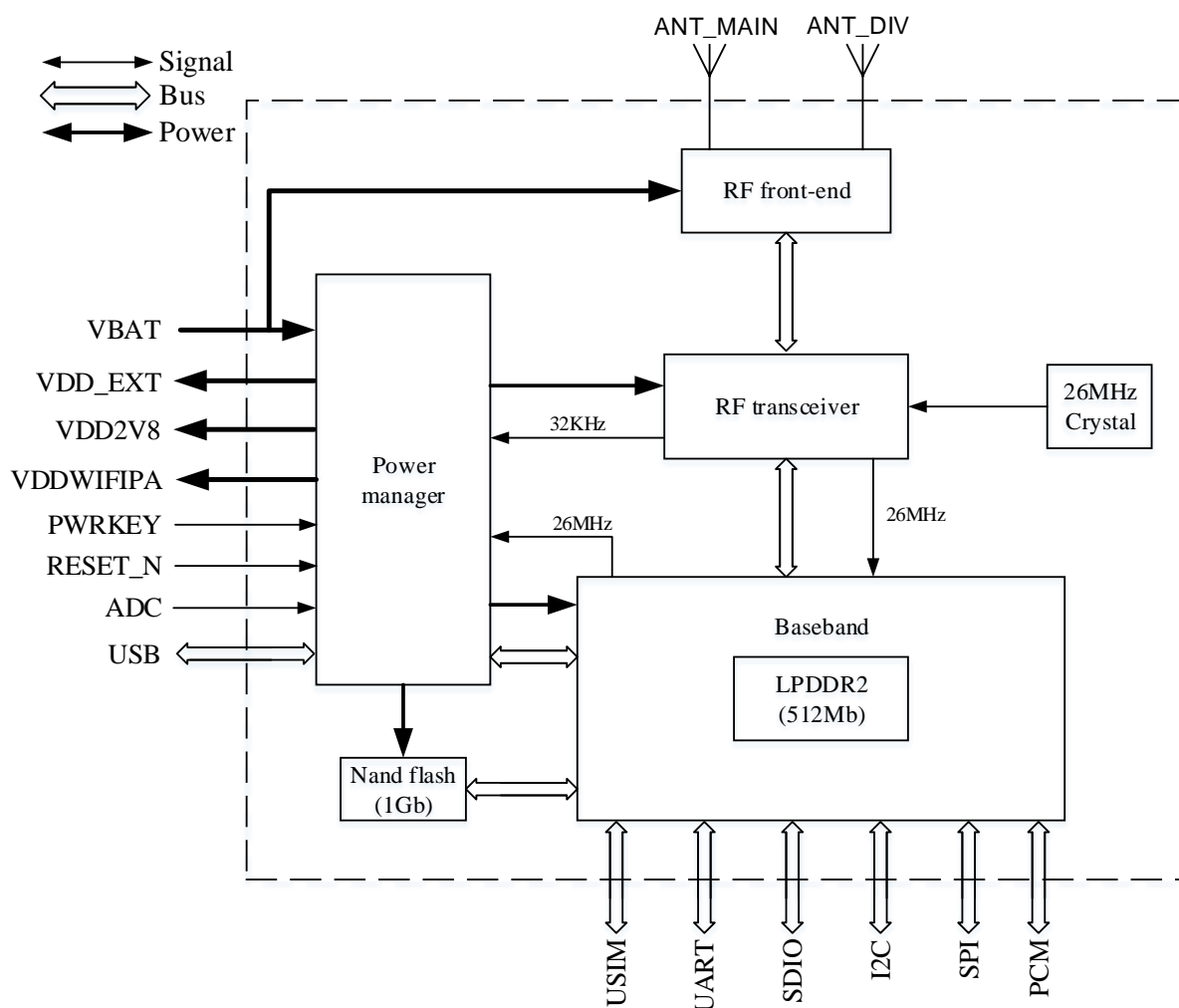
The N77-GL module has a total of 144 pins and uses LGA packaging with a size of (29.0±0.1) mm × (32.0±0.1) mm × (2.4±0.2) mm. It has industrial-grade high performance and is suitable for developing IoT communication devices such as wireless meter reading terminals, vehicles, handheld POS, industrial routers, and so on.

2.2 Block Diagram

N77-GL consists of the following functionality units:

- Baseband chip
- 26 MHz crystal
- Power management
- Radio frequency unit
- Storage unit
- Digital interface (USIM, USB, UART, SDIO, I2C, SPI, PCM)
- Analog interface (ADC)

Figure 2-1 Block diagram



2.3 Basic Features

Parameter	Description
Physical features	<ul style="list-style-type: none"> Dimensions: (29.0±0.1) mm × (32.0±0.1) mm × (2.4±0.2) mm Package: LGA Weight: TBD
Temperature ranges	Operating: -30°C to +75°C Extended ¹ : -40°C to +85°C Storage: -40°C to +90°C
Operating	VBAT: 3.4 V to 4.2 V, typical value: 3.6 V

extended temperature¹: The module can be registered on the network, but some indicators cannot meet 3GPP standards.

voltage	
	Sleep mode ² : TBD
Operating current	Standby mode ³ : TBD
	Operating mode ⁴ (LTE mode): TBD
Application processor	ARM Cortex-A7 processor, with CPU clock speed up to 1.0 GHz, 64 KB L1 and 128 KB L2 cache.
Memory	RAM: 512 Mb ROM: 1 Gb
Band	See Table 2-1.
Wireless rate	GPRS: Max 85.6 kbps (DL)/Max 85.6 kbps (UL) EDGE: Max 236.8 kbps (DL)/Max 236.8 kbps (UL) WCDMA: HSDPA, Max 21 Mbps (DL) /Max 5.76 Mbps (UL) LTE-FDD: Cat4, Max 150 Mbps (DL)/Max 50 Mbps (UL) LTE-TDD: Cat4, Max 130 Mbps (DL)/Max 30 Mbps (UL)
Transmit power	GPRS 850/900 MHz: 33 ± 2 dBm (Power Class 4) GPRS 1800/1900 MHz: 30 ± 2 dBm (Power Class 1) EDGE 850/900 MHz: 27 ± 3 dBm (Power Class E2) EDGE 1800/1900 MHz: 26 ± 3 dBm (Power Class E2) WCDMA: $24+1/-3$ dBm (Power Class 3) LTE: 23 ± 2 dBm (Power Class 3)
Application interfaces	2G/3G/4G main antenna, 3G/4G diversity reception antenna The characteristic impedance of each antenna is 50 Ω .
	Three UART interfaces, one of which is a Debug interface.
	Two I2C interfaces, for master mode only
	One SPI interface
	Two USIM interfaces, supporting either 1.8 V or 3.0 V USIM card.
	One USB2.0 interface
	Two SDIO 3.0 interface, with SDC1 used for WLAN and SDC2 used for SD cards.
	Two 11-bit ADC interfaces, with voltage detection ranging from 0.1 V to VBAT.

Current in sleep mode² means the current drawn by the module in sleep mode, a low power consumption state, in which its RF function is functioning properly but its peripheral interfaces are disabled. If there is an incoming call or SMS, the module will exit from the sleep mode, and after the incoming call or voice instant messaging has ended, the module will re-enter the sleep mode.

Current in standby mode³: means the current drawn by the module in a normal operating mode, but no data service is being processed.

Current in operating mode⁴ operating current of the module when there is data communication. Only the currents in LTE mode are listed here. For details about currents under other network standards, see the N725 current test report.

AT commands	3GPP Release 11 Neoway extended AT commands
SMS	PDU, TXT
Data	PPP, ECM
Protocol	TCP, UDP, FTP, HTTP*/HTTPS*
Certification approval	RoHS, CE

* means under development.

3 Reference Standards

N77-GL is designed by referring to the following standards:

- 3GPP TS 36.521-1 V9.10.0 User Equipment (UE) conformance specification; Radio transmission and reception; Part 3: Radio Resource Management (RRM) conformance testing
- 3GPP TS 21.111 V9.0.0 USIM and IC card requirements
- 3GPP TS 31.102 V9.19.0 Characteristics of the Universal Subscriber Identity Module (USIM) application
- 3GPP TS 31.111 V9.12.2 Universal Subscriber Identity Module (USIM) Application Toolkit (USAT)
- 3GPP TS 27.007 V9.9.0 AT command set for User Equipment (UE)
- 3GPP TS 27.005 V9.0.1 Use of Data Terminal Equipment – Data Circuit terminating Equipment (DTE - DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)

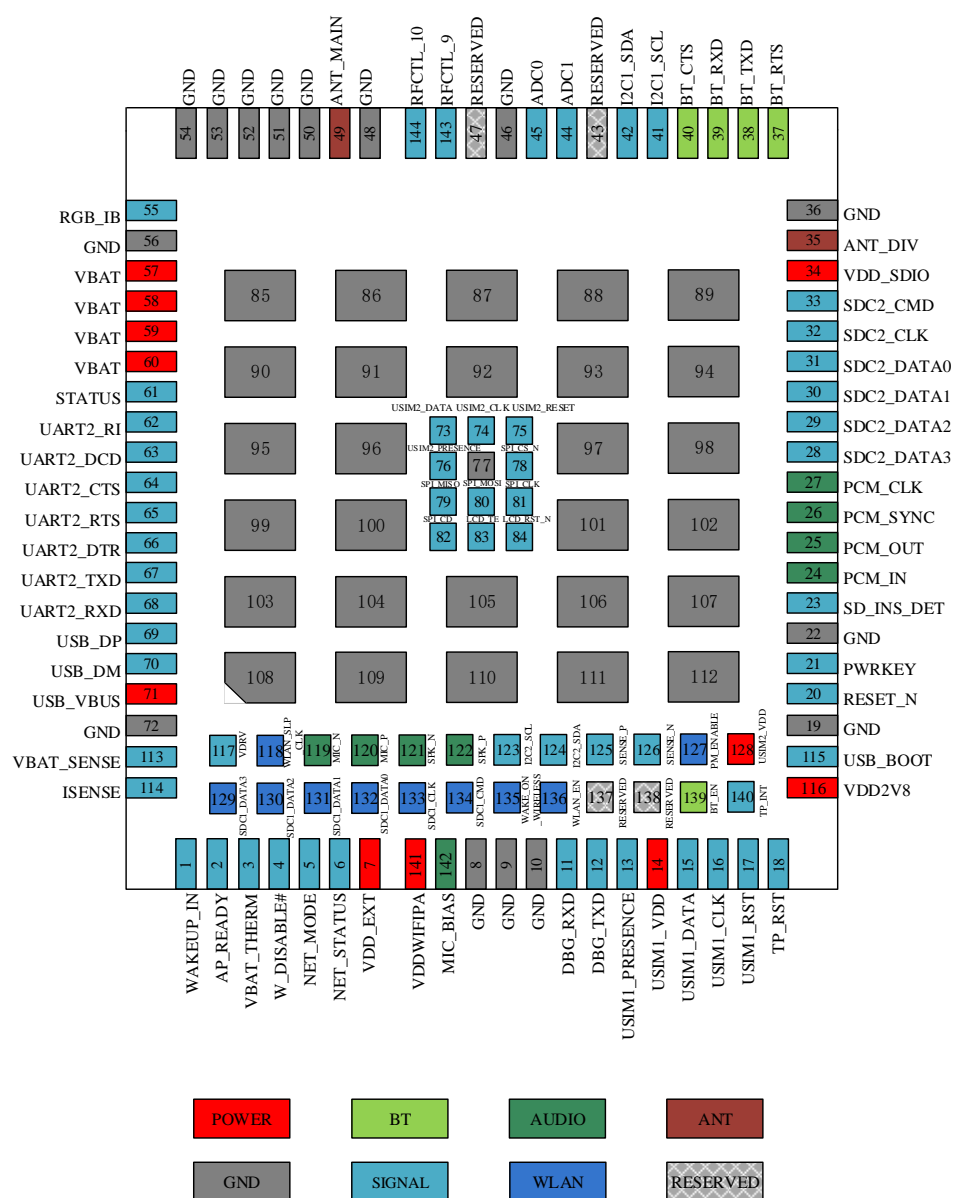
4 Pad Layout

There are 144 pins on N77-GL module and their pads are introduced in LGA package.

4.1 Pad Layout

Table 2-1 shows the N77-GL pad layout.

Figure 4-1 N77-GL pad layout (top view)

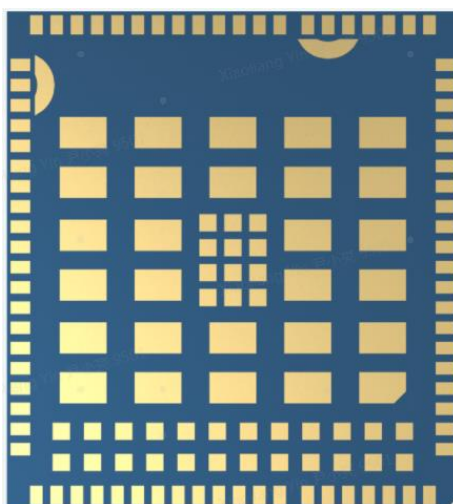


4.2 Module Appearance

Figure 4-2 Top view of N77-GL



Figure 4-3 Bottom view of N77-GL



The label and bottom views of the N77-GL module in the above picture are for reference only. Detailed information is in accordance with the final product.

5 Electrical Characteristics and Reliability

5.1 Electrical Characteristics



- If the voltage is lower than the threshold, the module might fail to start. If the voltage is higher than threshold or there is a voltage burst during the startup, the module might be damaged permanently.
- When using LDO or DC-DC to power the module, ensure that it can output at least 2.5 A of instantaneous current. The 2.5 A current corresponds to the maximum power level of the module during GSM mode, and the peak current during burst transmission only lasts for a short time. Placing a large capacitor at the VBAT pin of the module can effectively enhance the freewheeling current of the power supply, preventing abnormalities like module shutdown caused by excessive voltage drop.

Table 5-1 N77-GL operating conditions

Parameter		Minimum value	Typical value	Max. value
VBAT	V _{in}	3.4 V	3.6 V	4.2 V
	I _{in}	N/A	N/A	2.5 A

5.2 Temperature Characteristics

Table 5-2 N77-GL temperature characteristics

Parameter	Minimum value	Typical value	Max. value
Operating	-30°C	25°C	75°C
Extended	-40°C	25°C	85°C
Storage	-40°C	25°C	90°C



If the module works in an environment where the temperature exceeds the thresholds of the operating temperature range, some of its RF performance indicators might be worse but after the temperature is restored, the RF index can be restored to meet the 3GPP standard.

5.3 ESD Protection Characteristics

To guarantee quality, electronic products are required to undergo comprehensive electrostatic discharge (ESD) testing. Therefore, it is crucial to take into account the electrostatic protection capabilities of the primary module pins during the design of related products. The following is the ESD protection characteristic data of this module. When designing related products, you need to add appropriate ESD protection according to the industry, depending on the industry in which the product will be used to prevent damage and ensure optimal performance.

Test environment: humidity 45%; temperature 25°C

Table 5-3 N77-GL ESD protection characteristics

Contact point	Contact discharge	Air discharge
GND	TBD	TBD
ANT	TBD	TBD
Shielding cover	TBD	TBD

6 RF Characteristics

The N77-GL module can provide connectivity on GSM, WCDMA, FDD-LTE (Cat4), and TDD-LTE (Cat4) networks. This chapter introduces the RF characteristics of N77-GL.

6.1 Operating Frequency Bands

Table 6-1 N77-GL operating frequency bands

Operating band	Uplink	Downlink
GSM850	824 - 849 MHz	869 - 894 MHz
EGSM900	880 - 915 MHz	925 - 960 MHz
DCS1800	1710 - 1785 MHz	1805 - 1880 MHz
PCS1900	1850 - 1910 MHz	1930 - 1990 MHz
WCDMA B1	1920 - 1980 MHz	2110 - 2170 MHz
WCDMA B2	1850 - 1910 MHz	1930 - 1990 MHz
WCDMA B5	824 - 849 MHz	869 - 894 MHz
WCDMA B8	880 - 915 MHz	925 - 960 MHz
FDD-LTE B1	1920 - 1980 MHz	2110 - 2170 MHz
FDD-LTE B2	1850 - 1910 MHz	1930 - 1990 MHz
FDD-LTE B3	1710 - 1785 MHz	1805 - 1880 MHz
FDD-LTE B4	1710 - 1755 MHz	2110 - 2155 MHz
FDD-LTE B5	824 - 849 MHz	869 - 894 MHz
FDD-LTE B7	2500 - 2570 MHz	2620 - 2690 MHz
FDD-LTE B8	880 - 915 MHz	925 - 960 MHz
FDD-LTE B12	699 - 716 MHz	729 - 746 MHz
FDD-LTE B13	777 - 787 MHz	746 - 756 MHz
FDD-LTE B17	704 - 716 MHz	734 - 746 MHz
FDD-LTE B18	815 - 830 MHz	860 - 875 MHz
FDD-LTE B19	830 - 845 MHz	875 - 890 MHz
FDD-LTE B20	832 - 862 MHz	791 - 821 MHz

FDD-LTE B26	814 - 849 MHz	859 - 894 MHz
FDD-LTE B28	703 - 748 MHz	758 - 803 MHz
TDD-LTE B34	2010 - 2025 MHz	2010 - 2025 MHz
TDD-LTE B38	2570 - 2620 MHz	2570 - 2620 MHz
TDD-LTE B39	1880 - 1920 MHz	1880 - 1920 MHz
TDD-LTE B40	2300 - 2400 MHz	2300 - 2400 MHz
TDD-LTE B41	2496 - 2690 MHz	2496 - 2690 MHz
FDD-LTE B66	1710 - 1780 MHz	2110 - 2180 MHz

6.2 TX Power and RX Sensitivity

Table 6-2 N77-GL RFTX power

Band	Max power	Min. power
GSM850	33 dBm \pm 2 dB	5 dBm \pm 5 dB
EGSM900	33 dBm \pm 2 dB	5 dBm \pm 5 dB
DCS1800	30 dBm \pm 2 dB	0 dBm \pm 5 dB
PCS1900	30 dBm \pm 2 dB	0 dBm \pm 5 dB
WCDMA B1	24 dBm+1/-3 dB	< -50 dBm
WCDMA B2	24 dBm+1/-3 dB	< -50 dBm
WCDMA B5	24 dBm+1/-3 dB	< -50 dBm
WCDMA B8	24 dBm+1/-3 dB	< -50 dBm
FDD-LTE B1	23 dBm \pm 2 dB	< -39 dBm
FDD-LTE B2	23 dBm \pm 2 dB	< -39 dBm
FDD-LTE B3	23 dBm \pm 2 dB	< -39 dBm
FDD-LTE B4	23 dBm \pm 2 dB	< -39 dBm
FDD-LTE B5	23 dBm \pm 2 dB	< -39 dBm
FDD-LTE B7	23 dBm \pm 2 dB	< -39 dBm
FDD-LTE B8	23 dBm \pm 2 dB	< -39 dBm
FDD-LTE B12	23 dBm \pm 2 dB	< -39 dBm
FDD-LTE B13	23 dBm \pm 2 dB	< -39 dBm
FDD-LTE B17	23 dBm \pm 2 dB	< -39 dBm

FDD-LTE B18	23 dBm \pm 2 dB	< -39 dBm
FDD-LTE B19	23 dBm \pm 2 dB	< -39 dBm
FDD-LTE B20	23 dBm \pm 2 dB	< -39 dBm
FDD-LTE B26	23 dBm \pm 2 dB	< -39 dBm
FDD-LTE B28	23 dBm \pm 2 dB	< -39 dBm
TDD-LTE B34	23 dBm \pm 2 dB	< -39 dBm
TDD-LTE B38	23 dBm \pm 2 dB	< -39 dBm
TDD-LTE B39	23 dBm \pm 2 dB	< -39 dBm
TDD-LTE B40	23 dBm \pm 2 dB	< -39 dBm
TDD-LTE B41	23 dBm \pm 2 dB	< -39 dBm
FDD-LTE B66	23 dBm \pm 2 dB	< -39 dBm

Table 6-3 RF sensitivity of N77-GL

Band	RX sensitivity
GSM850	\leq -107 dBm
EGSM900	\leq -107 dBm
DCS1800	\leq -107 dBm
PCS1900	\leq -107 dBm
WCDMA B1	\leq -107 dBm
WCDMA B2	\leq -107 dBm
WCDMA B5	\leq -107 dBm
WCDMA B8	\leq -107 dBm
FDD-LTE B1	\leq -97 dBm
FDD-LTE B2	\leq -95 dBm
FDD-LTE B3	\leq -94 dBm
FDD-LTE B4	\leq -97 dBm
FDD-LTE B5	\leq -95 dBm
FDD-LTE B7	\leq -95 dBm
FDD-LTE B8	\leq -94 dBm
FDD-LTE B12	\leq -94 dBm
FDD-LTE B13	\leq -94 dBm
FDD-LTE B17	\leq -94 dBm

FDD-LTE B18	≤ -97 dBm
FDD-LTE B19	≤ -97 dBm
FDD-LTE B20	≤ -94 dBm
FDD-LTE B26	≤ -94.5 dBm
FDD-LTE B28	≤ -95.5 dBm
TDD-LTE B34	≤ -97 dBm
TDD-LTE B38	≤ -97 dBm
TDD-LTE B39	≤ -97 dBm
TDD-LTE B40	≤ -97 dBm
TDD-LTE B41	≤ -95 dBm
FDD-LTE B66	≤ -96.5 dBm



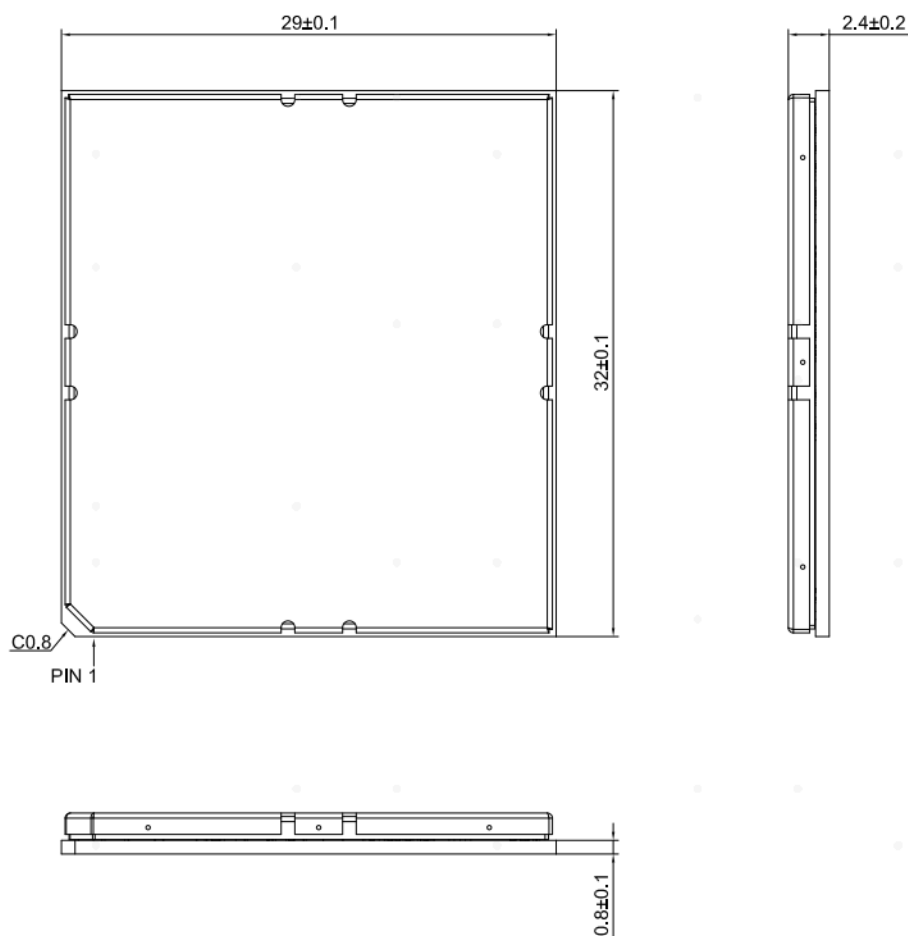
The preceding indexes are test data in a laboratory environment. The test results of LTE in a bandwidth of 10MHz will have a certain deviation due to the influence of the network environment.

7 Mechanical Characteristics

This chapter introduces mechanical characteristics of N77-GL.

7.1 Dimensions

Figure 7-1 N77-GL top and side view dimensions (unit: mm)



7.2 Labeling

The label information is laser carved on the cover. The following figure shows the label of N77-GL.



The picture above is only for reference.

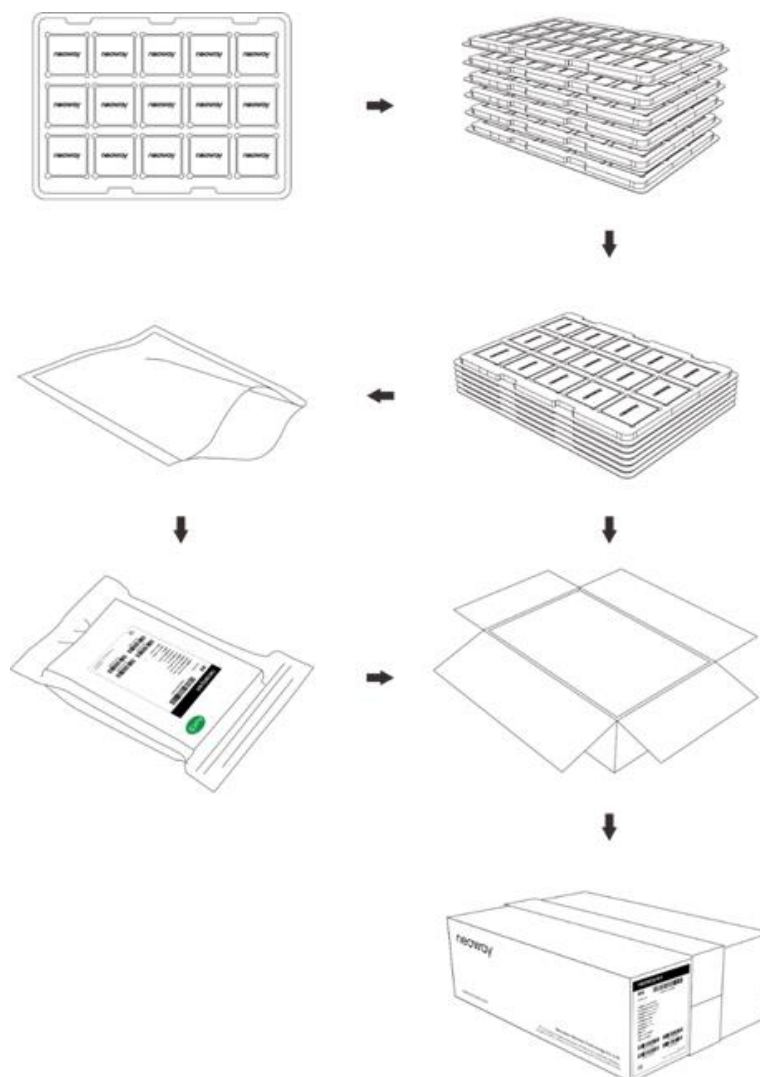
7.3 Packaging

N77-GL adopts the SMD reflow soldering process for electronics assembly. The modules are delivered in trays, which are packed in vacuumed moisture-proof aluminium foil bag. To ensure the dryness of the product and prolong their service life, the bag also holds desiccant and a humidity indicator card.

7.3.1 Tray

Neoway modules are delivered on trays as shown below:

Figure 7-2 N77-GL packaging



The above figure is for reference only. For authentic appearance, please refer to the module that you receive from Neoway.

7.3.2 Moisture Sensitivity Level



N77-GL is a level 3 moisture-sensitive electronic element, in compliance IPC/ JEDEC J-STD-020 standard.

After unpacking, avoid leaving the module exposed to air for too long. If exposed to air for a prolonged period, the module could become damp, increasing the risk of damage during reflow soldering or laboratory soldering. Bake it before mounting the module. The baking conditions depend on the moisture degree. It is recommended to bake the module at temperatures higher than 90 degrees for more than 12 hours. In addition, since the package tray is made of non-high temperature resistant material, do not bake modules with the package tray directly.

8 Mounting N77-GL onto Application Board

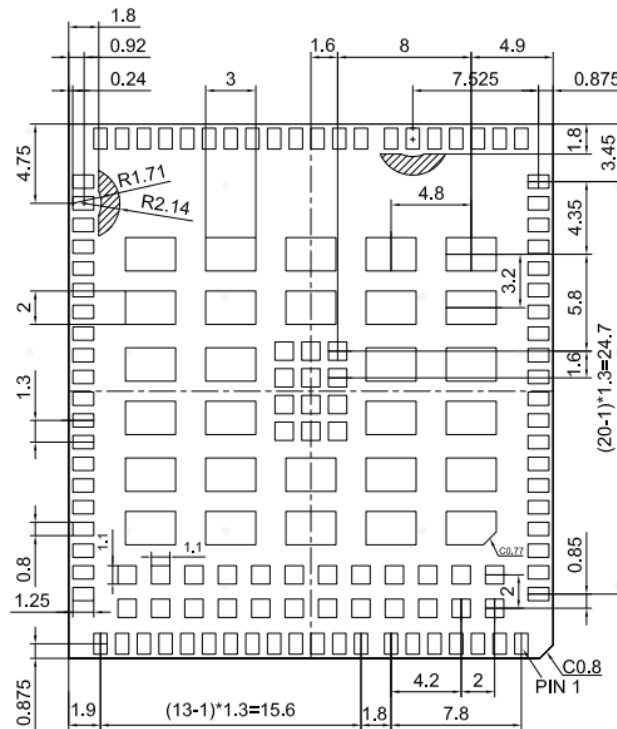
The N77-GL module is assembled using the 144-pin LGA package and SMT soldering method.

8.1 PCB Package



- To ensure proper operation of the module, only GND via-holes and copper pouring are allowed within the shaded area "B" of the PCB package.
- To achieve higher yield during module production, it is recommended that the distance between other components on the PCB board and the module pads be at least 3 mm to avoid the risk of tin connection when using stepped stencil.

Figure 8-1 Bottom view of N77-GL PCB package (unit: mm)



8.2 Stencil

It is recommended to use stencil thickness of at least 0.15 mm to 0.20 mm (0.18 mm recommended), which can be adjusted as per the actual SMT situation.

8.3 Solder Paste

The thickness of solder paste and the flatness of PCB are essential for the production yield.

It is recommended to use the same kind of leaded solder paste used during the production process of Neoway.

- The melting point of the leaded solder paste is 35°C lower than that of the lead-free solder paste, and the temperature in the reflow process parameters is also lower than that of the lead-free solder paste. Therefore, the soldering time is shorter accordingly, which easily causes a false solder because LGA in the module is in a semi-melted state during the secondary reflow.
- When using only solder pastes with lead, please ensure that the time above 220°C (reflow temperature) exceeds 45 seconds and the peak temperature does not exceed 240°C.

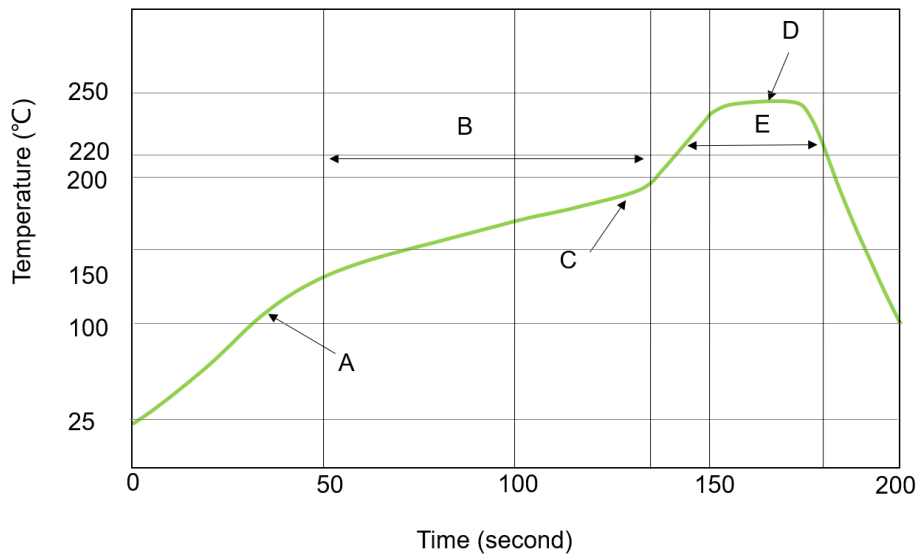
8.4 Oven Temperature Profile



Neoway will not provide warranties for heat-responsive element abnormalities caused by improper temperature control.

If the PCB is large, it is important to avoid bending of the printed circuit material during an SMT process. So a bending prevention tool must be placed on the bottom of the printed circuit board. It is recommended to use loading tools during the SMT and reflow soldering process to avoid poor solder joint caused by PCB bending.

Figure 8-2 Oven temperature profile



Technical parameters:

- Ramp up rate: 1 to 4°C/sec
- Ramp down rate: -3 to -1°C/sec
- Soaking zone: 150 - 180°C, Time: 60 - 100s
- Reflow zone: >220°C, Time: 40 - 90s
- Peak temperature: 235 - 245°C

For information about cautions in storage and mounting, refer to
Neoway_Reflow_Soldering_Guidelines_For_Surface-Mounted_Modules.

When manually removing a module from your application's PCB board, it is important to use heat guns with large openings. Adjust the temperature to about 245°C (depending on the type of solder paste used) and heat the module until the solder paste melts. Use tweezers to remove the module, being careful not to shake it at high temperatures. Shaking the module may cause components inside to become misplaced.

9 Warnings

9.1 CE warnings

This equipment complies with CE radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body.

The simplified EU declaration of conformity referred to in Article 10(9) shall be provided as follows: Hereby, neoway declares that the radio equipment type [designation of type of radio equipment] is in compliance with Directive 2014/53/EU.

9.2 FCC warnings

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.

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.

This device is intended only for OEM integrators under the following conditions: (For module device use)

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 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.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

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: PJ7-N77-GL". The grantee's FCC ID can be used only when all FCC compliance requirements are met.

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.

OEM/Integrators Installation Manual

Important Notice to OEM integrators 1. This module is limited to OEM installation ONLY. 2. This module is limited to installation in mobile or fixed applications, according to Part 2.1091(b). 3. The separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093 and different antenna configurations 4. For FCC Part 15.31 (h) and (k): The host manufacturer is responsible for additional testing to verify compliance as a composite system. When testing the host device for compliance with Part 15 Subpart B, the host manufacturer is required to show compliance with Part 15 Subpart B while the transmitter module(s) are installed and operating. The modules should be transmitting and the evaluation should confirm that the module's intentional emissions are compliant (i.e. fundamental and out of band emissions). The host manufacturer must verify that there are no additional unintentional emissions other than what is permitted in Part 15 Subpart B or emissions are complaint with the transmitter(s) rule(s). The Grantee will provide guidance to the host manufacturer for Part 15 B requirements if needed.

Antenna

- (1) The antenna must be installed such that 20 cm is maintained between the antenna and users,
- (2) The transmitter module may not be co-located with any other transmitter or antenna.

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC/IC authorization is no longer considered valid and

the FCC ID/IC ID cannot 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/IC authorization. To comply with FCC regulations limiting both maximum RF output power and human exposure to RF radiation, maximum antenna gain (including cable loss) must not exceed 1.5dBi

List of applicable FCC rules :

This module has been tested and found to comply with part 22, part 24, part 27, part 90, requirements for Modular Approval. The modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional radiator digital circuitry), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

10 Abbreviations

Abbreviation	Full name
AI	Analog Input
AO	Analog Output
ARM	Advanced RISC Machine
Bps	Bits per Second
CCC	China Compulsory Certification
CS	Chip Select
CTS	Clear to Send
DC	Direct Current
DCS	Digital Cellular System
DI	Digital Input
DL	Downlink
DO	Digital Output
DRX	Discontinuous Reception
EGSM	Enhanced GSM
ESD	Electronic Static Discharge
ESR	Equivalent Series Resistance
EVK	Evaluation Kit
FDD	Frequency Division Duplexing
GNSS	Global Navigation Satellite System
GPIO	General Purpose Input Output
3GPP	3rd Generation Partnership Project
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
I2C	Inter-Integrated Circuit
IO	Input/Output
LCC	Leadless Chip Carriers
LED	Light Emitting Diode

LGA	Land Grid Array
LTE	Long Term Evolution
MCLK	Main Clock
MCU	Microcontroller Unit
PCB	Printed Circuit Board
PWM	Pulse Width Modulation
RAM	Random Access Memory
RF	Radio Frequency
ROM	Read-only Memory
SDIO	Secure Digital Input Output
SPI	Serial Peripheral Interface
TDD	Time Division Duplex
UART	Universal Asynchronous Receiver-Transmitter
UL	Uplink
USB	Universal Serial Bus
USIM	Universal Subscriber Identity Module
VBAT	Battery Voltage
WiFi	Wireless Fidelity
WCDMA	Wide-band Code Division Multiple Access
WLAN	Wireless Local Area Network