N75

Product Specifications

Issue 1.3 Date 2020-05-13

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Notice

This document provides a guide for users to use N75.

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 the N75 series.

It defines the features, indicators, and test standards of the N75 module.

Audience

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

Change History

Issue	Date	Change	Changed By
1.0	2019-03	Initial draft	Wang Qiang
1.1	2019-08	• Deleted Band14 of N75-NA and N75-A • Updated the label of module • Changed the Variant E to EA • Added the Variant NF • Updated the document template	Zhuo Jianzheng
1.2	2020-01	• Added N75-LA • Deleted N75-JP • Added the wireless rate of TDD-LTE in section 1.3 • Updated the RF features	Dong Liuting
1.3	2020-04	• Added Band41 of N75-EA • Added N75-JP	Dong Liuting

Conventions

Symbol	Indication
(!)	Means danger. You are in a situation that could cause fatal device damage or even bodily damage.

⚠	Means the 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

Related Documents

Neoway_N75_Datasheet

Neoway_N75_Hardware_User_Guide

Neoway_N75_AT_Command_Mannual

Neoway_N75_EVK_User_Guide

Neoway Module Reflow Manufacturing Recommendations

1 About N75

N75 is an industrial-grade 4G module developed on a Qualcomm platform. It supports GSM/GPRS/EDGE, WCDMAR99 to DC-HSPA+, and LTE Cat 4. With various hardware interfaces and optional GNSS functions, the N75 is well applicable to wireless metering terminals, in-vehicle terminals, POS, industrial routers, and other IoT terminals.

1.1 Product Overview

N75 series include multiple variants. Table 1-1 lists the variants and frequency bands supported.

Table 1-1 Variant and frequency bands

Variant	Region	Category	Band	GNSS[1]
NA	North America	Cat 4	FDD-LTE: B2, B4, B5, B7, B12, B13, B25, B26, B66, B71 UMTS: B2, B4, B5 GSM/GPRS/EDGE: 850/1900 MHz	Support
NF	North America	Cat 4	FDD-LTE: B2, B4, B5, B7, B12, B13, B14, B25, B26, B66, B71 UMTS: B2, B4, B5 GSM/GPRS/EDGE: 850/1900 MHz	Not support
A	North America	Cat 4	FDD-LTE: B2, B4, B5, B12, B66 UMTS: B2, B4, B5	Support
EA	European Union	Cat 4	FDD-LTE: B1, B3, B5, B7, B8, B20, B28 TDD-LTE: B38, B40, B41 UMTS: B1, B5, B8 GSM/GPRS/EDGE: 900/1800 MHz	Support
LA*	Latin America	Cat 4	FDD-LTE: B1, B2, B3, B4, B5, B7, B8, B10, B28, B66 TDD-LTE: B38, B40, B41 UMTS: B1, B2, B4, B5, B8 GSM/GPRS/EDGE: 850/900/1800/1900 MHz	Support
JP*	Japan	Cat 4	FDD-LTE: B1, B3, B8, B18, B19, B26, B28 TDD-LTE: B41	Support

[1] GNSS optional for some variants

UMTS: B1, B6, B8, B19

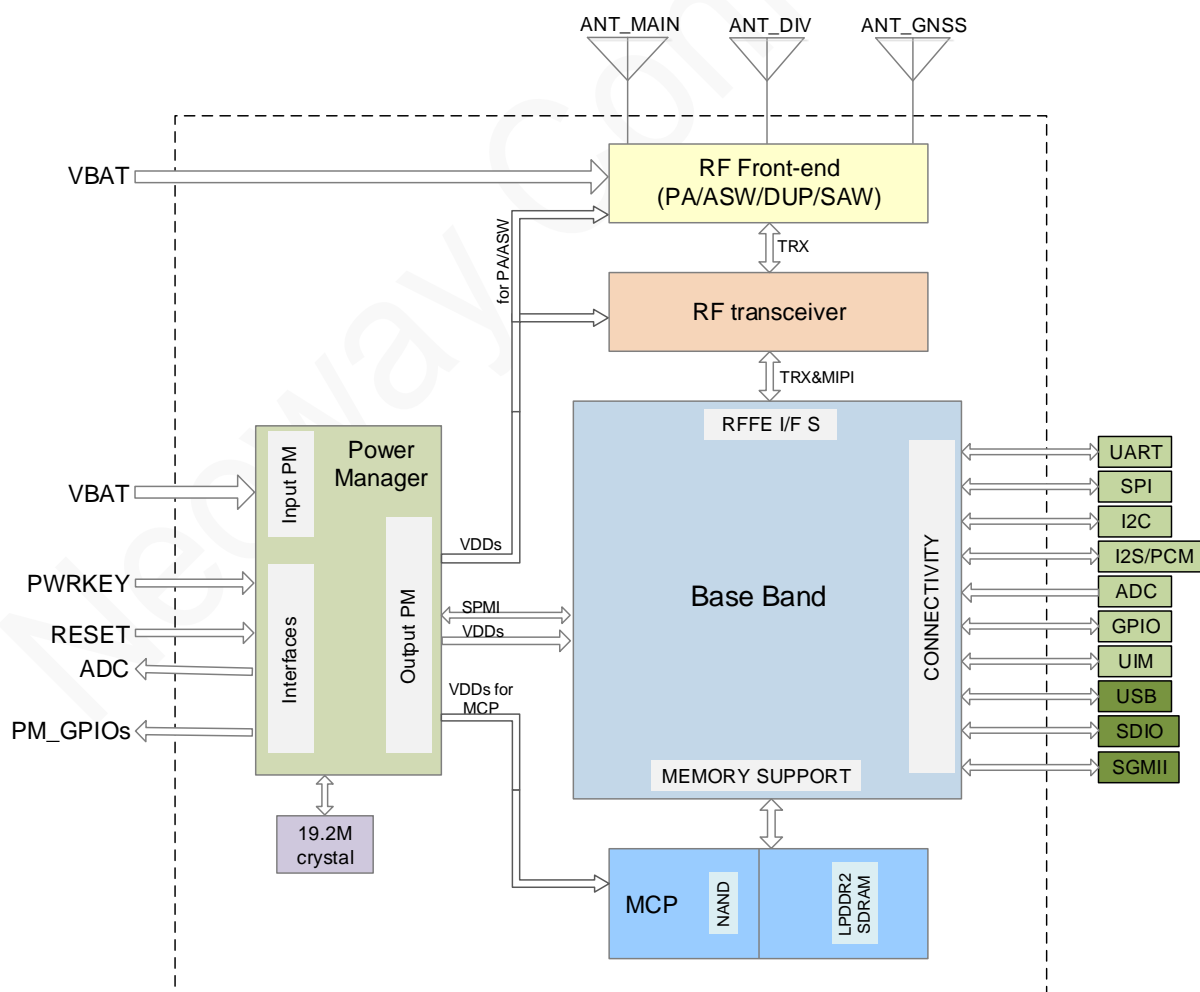* in development

1.2 Block Diagram

N75 consists of the following functionality units:

- Baseband

- MCP

- Power management unit

- 19.2 MHz crystal oscillator

- RF section

- Digital interfaces (UIM, SPI, I2C, SGMII, SDIO, ADC, GPIO, UART, USB)

Figure 1-1 Block Diagram

1.3 Basic Features

Parameter	Description	
Physical features	Dimensions: (30.0±0.1) mm × (28.0±0.1) mm × (2.8±0.15) mm Package: 100-pin LGA Weight: around 5.3g	
Temperature ranges	Operating: -35°C to +75°C Extended: -40°C to +85°C Storage: -45°C to +90°C	
Operating voltage	VBAT: 3.3V to 4.3V, TYP: 3.8V	
Current	Flight mode	1.24 mA
	Sleep Mode	GSM DRX=6: 2.2 mA GSM DRX=9: 1.45 mA WCDMA DRX=2: 2.64 mA WCDMA DRX=9: 1.54 mA LTE (Paging Cycle 320 ms): 6.5 mA LTE (Paging Cycle 2.56s): 1.67 mA
	Active	VBAT: 2A Max
MIPS processor	ARM Cortex-A7 microprocessor cores at 1.3 GHz	
Memory	ROM+RAM: ● 2 Gb+1 Gb ● 4 Gb+2 Gb	
Operating Bands	See Table 1-1.	
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: DC-HSPA+, Max 42 Mbps (DL)/Max 5.76 Mbps (UL) FDD-LTE: non-CA cat4, Max 150 Mbps(DL)/Max 50 Mbps (UL) TDD-LTE: non-CA cat4, Max 130 Mbps(DL)/Max 35 Mbps (UL)	
Transmit power	GSM850: (33 dBm±2 dB) (Power Class 4) GSM900: (33 dBm±2 dB) (Power Class 4) DCS1800: (30 dBm±2 dB) (Power Class 1) PCS1900: (30 dBm±2 dB) (Power Class 1) EDGE 850 MHz: (27 dBm±3 dB) (Power Class E2) EDGE1900 MHz: (26 dBm±3 dB) (Power Class E2) UMTS: (24 dBm+1/-3 dB) (Power Class 3) LTE: (23 dBm±2 dB) (Power Class 3)	
Application Interfaces	2G/3G/4G antenna interface, diversity antenna interface, GNSS antenna interface 50Ω impedance	
	Two UART interfaces: one is an ordinary serial port, and one is used for	

	Bluetooth by default
	One I2C interface, supporting only host mode
	One SPI interface, supporting only host mode and max 50 MHz
	One USIM interface, 1.8V/3V
	One USB2.0 interface, OTG function requires external 5V DC-DC
	Two 15-bit ADC interfaces, detectable voltage ranging from 0.1 to 1.7V
	One I2S/PCM interface, to connect CODEC chipset
	One SDIO interface, used for WLAN
	One SGMII/MDIO interface, used for Ethernet
	Four GPIO interfaces
AT command	Neoway extended commands
Data	PPP, RNDIS, ECM, RMNET
Protocol	TCP, UDP, MQTT, FTP/FTPS, HTTP/HTTP(S), SSL, TLS
Certification approval	FCC, PTCRB, AT&T, CE-R, GCF, RoHS, NCC*, RCM*

2 Compliant Standards

- 3GPP TS 07.07 AT command set for GSM Mobile Equipment (ME)

- YD 1214-2006 Technical requirement of 900/1800 MHz TDMA Digital Cellular Mobile Telecommunication Network General Packet Radio Service (GPRS)Equipment: Mobile Stations

- YD 1215-2006 Testing Methods of 900/1800 MHz TDMA Digital Cellular Mobile Telecommunication Network General Packet Radio Service (GPRS)Equipment: Mobile Stations

- YD 1032-2000 Limits and Measurement Methods of Electromagnetic Compatibility for 900/1800 MHz Digital Cellular Telecommunications System Part1: Mobile Station and Ancillary Equipment

- YD/T 2220-2011 Technical Requirement and test method of WCDMA/GSM(GPRS) dual-mode digit mobile user equipment (phase 4)

- Ministry of Industry and Information Technology PRC, Measures for the Network Access Management of Telecommunication Equipment (2014 Amendment)

- GB4943.1-2011 Information technology equipment - Safety - Part 1: General requirements

- GB/T22450.1-2008 Limits and measurement methods of electromagnetic compatibility for 900/1800 MHz TDMA digital cellular telecommunications system - Part 1: Mobile station and ancillary equipment

- CNCA-O7C-031:2007 Rules for Compulsory Certification of Telecommunication Equipment Telecommunication Terminal Equipment

- 3GPP TS GSM Specification Set

- 3GPP TS WCDMA Specification Set

- 3GPP TS LTE Cat4 4G Specification Set
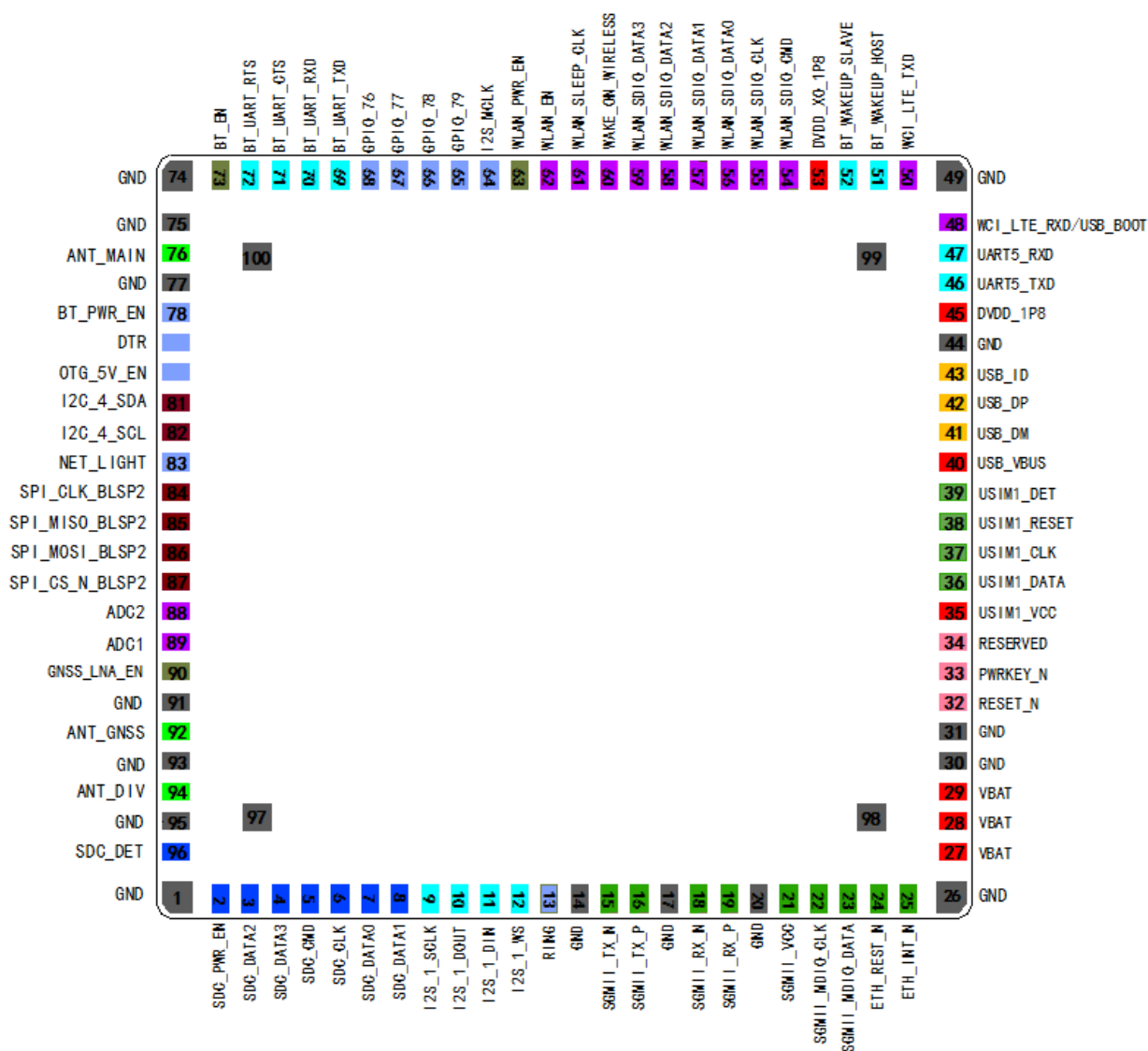
3 Pins and Appearance

There are 100 pins on N75 and their pads are introduced in the LGA package.

3.1 Pad Layout

Figure 2-1 shows the pad layout of the N75.

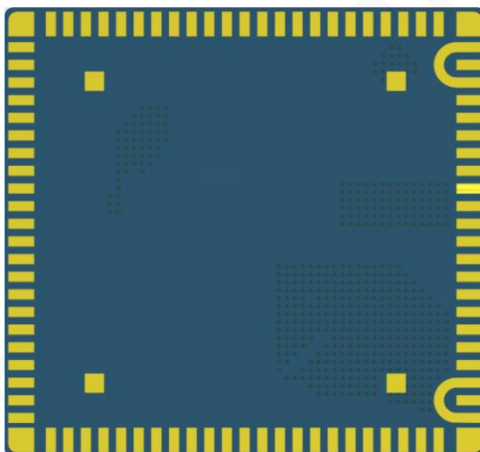Figure 3-1 N75 pin definition (Top View)

3.2 Appearance

Figure 3-1 Top view of the N75

Figure 3-1 Bottom view of the N75

Label in the above figure indicates the N75 NA variant. Labels of other variants are similar.

4 Electric Feature and Reliability

This chapter describes the electric features and reliability of N75, including the current and voltage of each power pin, operating and storage temperature ranges, and ESD protection features.

4.1 Electric Features

Table 4-1 Electric features

Parameter		Minimum Value	Typical Value	Maximum Value
VBAT	V_{in}	3.3V	3.8V	4.3V
	I_{in}	/	/	2A

⚠️
- If the voltage is lower than the threshold, the module might fail to start. If the voltage is higher than the threshold or there is a voltage burst during the startup, the module might be damaged permanently.
- If you use LDO or DC-DC to supply power for the module, ensure that it outputs at least 2 A current. When the module works at maximum power in GSM mode, the peak current might reach 2A. Add a large capacitor to the VBAT pin to enhance the capability to output continuous current and avoid voltage drop.

Table 4-2 Current consumption of N75

Variant	Status	Test Conditions	Test Result (Typ)	Unit
NA/NF/A	Power OFF	Shut down the module.	<50	µA
	Sleep Mode	GSM	<4	mA
		WCDMA	<4	mA
		LTE	<4	mA
	Active Mode	GSM850 Voice Call PCL=5	248	mA
		GSM1900 Voice Call PCL=0	172	mA
		GPRS850 1DL/4UL PCL=5	394	mA
		GPRS1900 1DL/4UL PCL=0	346	mA
		EGPRS850 1DL/4UL PCL=8	418	mA
		EGPRS1900 1DL/4UL PCL=2	436	mA
		WCDMA Band2@ Max Tx power	464	mA

		WCDMA Band4@ Max Tx power	560	mA
		WCDMA Band5@ Max Tx power	421	mA
		FDD-LTE Band2@ Max Tx power	495	mA
		FDD-LTE Band4@ Max Tx power	572	mA
		FDD-LTE Band5@ Max Tx power	441	mA
		FDD-LTE Band7@ Max Tx power	570	mA
		FDD-LTE Band12@ Max Tx power	534	mA
		TDD-LTE Band13@ Max Tx power	416	mA
		TDD-LTE Band14@ Max Tx power	517	mA
		TDD-LTE Band25@ Max Tx power	480	mA
		TDD-LTE Band26@ Max Tx power	462	mA
		TDD-LTE Band66@ Max Tx power	539	mA
		TDD-LTE Band71@ Max Tx power	530	mA
EA	Power OFF	Shut down the module.	<50	μA
	Sleep Mode	GSM	<4	mA
		WCDMA	<4	mA
		LTE	<4	mA
	Active Mode	GSM900 Voice Call PCL=5	250	mA
		GSM1800 Voice Call PCL=0	180	mA
		GPRS900 1DL/4UL PCL=5	400	mA
		GPRS1800 1DL/4UL PCL=0	350	mA
		EGPRS900 1DL/4UL PCL=8	420	mA
		EGPRS1800 1DL/4UL PCL=2	440	mA
		WCDMA Band1@ Max Tx power	520	mA
		WCDMA Band5@ Max Tx power	450	mA
		WCDMA Band8@ Max Tx power	520	mA
		FDD-LTE Band1@ Max Tx power	580	mA
		FDD-LTE Band3@ Max Tx power	525	mA
		FDD-LTE Band5@ Max Tx power	450	mA
		FDD-LTE Band7@ Max Tx power	620	mA
		FDD-LTE Band8@ Max Tx power	540	mA
		TDD-LTE Band20@ Max Tx power	540	mA
		TDD-LTE Band28@ Max Tx power	580	mA

		TDD-LTE Band38@ Max Tx power	340	mA
		TDD-LTE Band40@ Max Tx power	345	mA
		TDD-LTE Band41@ Max Tx power	330	mA
LA	Power OFF	Shut down the module.	TBD	µA
	Sleep Mode	GSM	TBD	mA
		WCDMA	TBD	mA
		LTE	TBD	mA
	Active Mode		TBD	mA

4.2 Temperature Features

Table 4-3 Temperature features

Status	Minimum Value	Typical Value	Maximum Value
Operating	-35°C	25°C	75°C
Extended	-40°C		85°C
Storage temperature	-45°C		90°C

> If the module works in an environment of -35°C to -40°C or 75°C to 85°C, RF performance might be worse. This does not affect the running of the module. The RF performance will meet the 3GPP standard after the temperature reaches the operating range.

4.3 ESD Protection

Electronics need to pass ESD tests. Table 4-4 shows the ESD capability of key pins of this module. It is recommended to add ESD protection based on the application scenarios to ensure product quality when designing a product.

Humidity 45%   Temperature 25°C

Table 4-4 ESD protection features

Testing Point	Contact Discharge	Air Discharge
VBAT	±8 kV	±15 kV

GND	±8 kV	±15 kV
ANT	±8 kV	±15 kV
Cover	±8 kV	±15 kV
Others	±2 kV	±4 kV

5 RF Features

N75 supports 2G/3G/4G network modes and frequency bands as well as GNSS function. This chapter describes the RF features of N75.

5.1 Operating Bands

Table 5-1 Operating Bands

Operating Bands	Uplink	Downlink
GSM850	824~849 MHz	869~894 MHz
GSM900	880~915 MHz	925~960 MHz
DCS1800	1710~1784 MHz	1805~1880 MHz
PCS1900	1850~1910 MHz	1930~1990 MHz
UMTS B1	1920~1980 MHz	2110~2170 MHz
UMTS B2	1850~1910 MHz	1930~1990 MHz
UMTS B4	1710~1755 MHz	2110~2155 MHz
UMTS B5	824~849 MHz	869~894 MHz
UMTS 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	728~746 MHz
FDD-LTE B13	777~787 MHz	746~757 MHz
FDD-LTE B14	788~798 MHz	758~768 MHz
FDD-LTE B20	832~862 MHz	791~821 MHz
FDD-LTE B25	1850~1915 MHz	1930~1995 MHz

FDD-LTE B26	814~849 MHz	859~894 MHz
FDD-LTE B28	703~748 MHz	758~803 MHz
TDD-LTE B38	2570~2620 MHz	2570~2620 MHz
TDD-LTE B40	2300~2400 MHz	2300~2400 MHz
TDD-LTE B41	2555~2655 MHz	2555~2655 MHz
FDD-LTE B66	1710~1780 MHz	2110~2200 MHz
FDD-LTE B71	617~652 MHz	663~698 MHz

5.2 TX Power and RX Sensitivity

Table 5-2 RF TX power

Band	TX Power	RX Sensitivity
GSM850	33 dBm+2/-2 dBm	<-108 dBm
GSM900	33 dBm+2/-2 dBm	<-108 dBm
DCS1800	30 dBm+2/-2 dBm	<-108 dBm
PCS1900	30 dBm+2/-2 dBm	<-108 dBm
UMTS B1	24 dBm +1/-3 dBm	<-110 dBm
UMTS B2	24 dBm +1/-3 dBm	<-110 dBm
UMTS B4	24 dBm +1/-3 dBm	<-109 dBm
UMTS B5	24 dBm +1/-3 dBm	<-110 dBm
UMTS B8	24 dBm +1/-3 dBm	<-110 dBm
FDD-LTE B1	23 dBm+2/-2 dBm	<-97 dBm
FDD-LTE B2	23 dBm+2/-2 dBm	<-98 dBm
FDD-LTE B3	23 dBm+2/-2 dBm	<-96.5 dBm
FDD-LTE B4	23 dBm+2/-2 dBm	<-98 dBm
FDD-LTE B5	23 dBm+2/-2 dBm	<-98 dBm
FDD-LTE B7	23 dBm+2/-2 dBm	<-95.5 dBm
FDD-LTE B8	23 dBm+2/-2 dBm	<-98 dBm
FDD-LTE B12	23 dBm+2/-2 dBm	<-95 dBm
FDD-LTE B13	23 dBm+2/-2 dBm	<-95 dBm
FDD-LTE B14	23 dBm+2/-2 dBm	<-95 dBm

FDD-LTE B20	23 dBm+2/-2 dBm	<-97 dBm
FDD-LTE B25	23 dBm+2/-2 dBm	<-98 dBm
FDD-LTE B26	23 dBm+2/-2 dBm	<-98 dBm
FDD-LTE B28	23 dBm+2/-2 dBm	<-97 dBm
TDD-LTE B38	23 dBm+2/-2 dBm	<-96.5 dBm
TDD-LTE B40	23 dBm+2/-2 dBm	<-97 dBm
TDD-LTE B41	23 dBm+2/-2 dBm	<-95 dBm
FDD-LTE B66	23 dBm+2/-2 dBm	<-98 dBm
FDD-LTE B71	23 dBm+2/-2 dBm	<-95 dBm

All values above were obtained in the lab. In actual applications, there might be a difference because of network environments.

5.3 GNSS Feature

Changes	Parameter
GPS L1 operating frequency	1575.42±1.023 MHz
GLONASS operating frequency	1597.5~1605.9 MHz
BDS operation frequency	1559.1~1563.1 MHz
Tracking sensitivity	-160 dBm (GPS)/-159.5 dBm (GLONASS)/TBD (BDS)
Acquisition sensitivity	-144 dBm (GPS)/-143.5 dBm (GLONASS)
Positioning precision (in air)	< 3 m (CEP50)
Hot start (in air)	<2.5s
Cold start (in air)	<35s
Update frequency	1 Hz by default
CNR in/CNR out	3 dB
Max. positioning altitude	18000m
Max. positioning speed	515 m/s
Max. positioning acceleration	4g
GNSS data type	NMEA-0183
GNSS antenna type	Passive/active antenna

Tracking sensitivity, acquisition sensitivity, and re-acquisition sensitivity were obtained in a signaling test on SPIRENT6300 and they are the maximum values of multiple tests on samples. No external LNA or active antenna was used in the test.
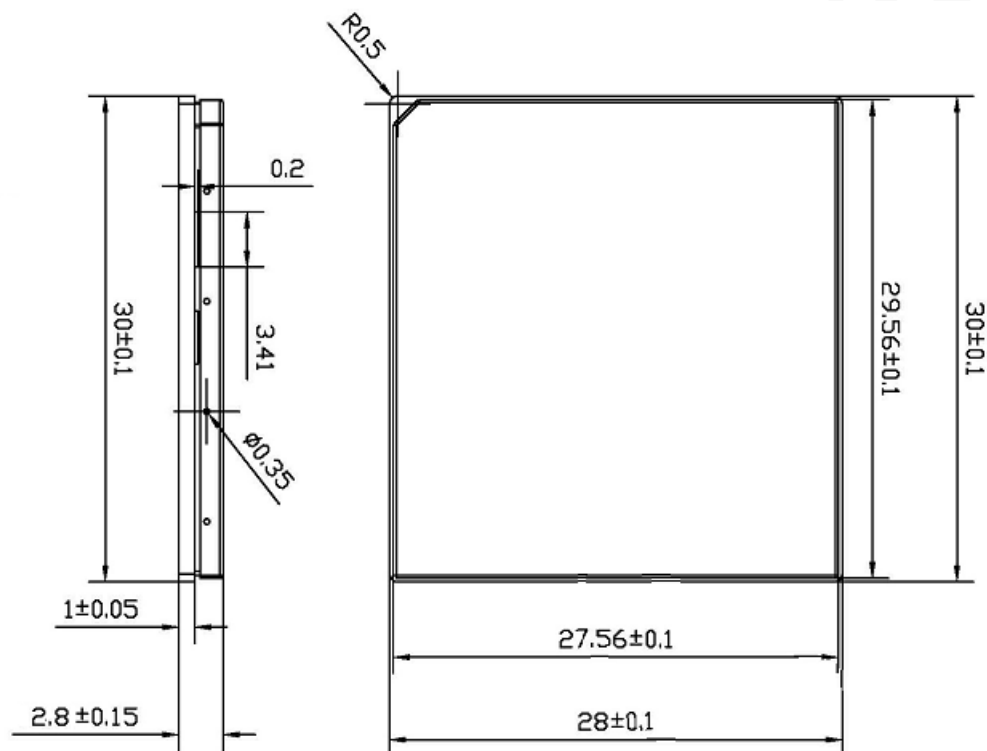
6 Mechanical Features

This chapter describes the mechanical features of the N75.

6.1 Dimensions

Figure 6-1 N75 dimensions

The unit is mm.

6.2 Label

The label information of N75 is curved on the cover.

Figure 6-2 N75 label

| | • | The picture above is only for reference. |
| | • | The silk-screen printing must be clear. No blur is allowed. |

6.3 Pack

N75 modules are packaged in sealed vacuum bags with dryer, humidity card, and tray on delivery to guarantee a long shelf life. Follow the same package method again in case of opened for any reason.
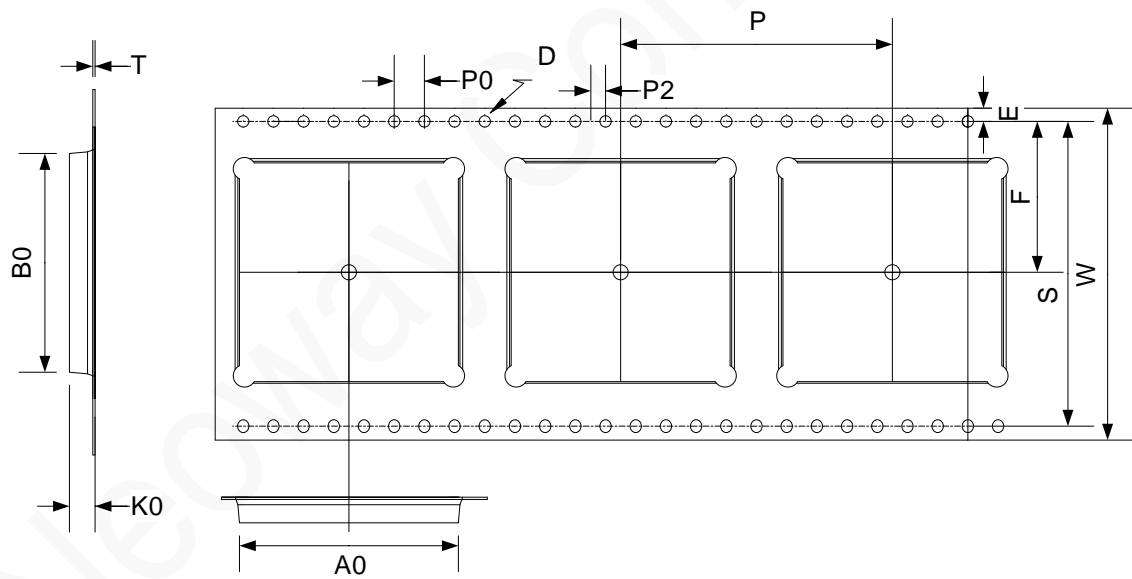
6.3.1 Reel&Tape

The N75 in mass production is shipped in the following package.
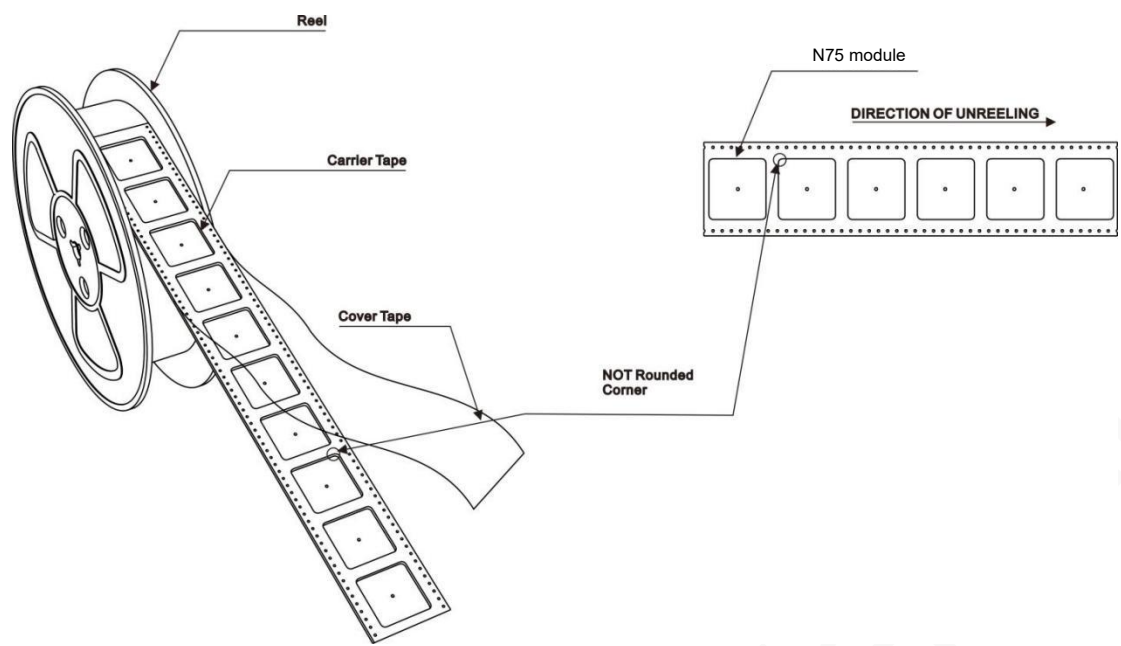
Tape

ITEM	W	A0	B0	S	D	E	F	K0	P0	P2	P	T
DIM	44.0	28.7	28.70	40.4	1.5	1.75	20.2	3.55	4.0	2.0	36.0	0.30
TOLE	+0.3 -0.3	+0.1 -0.1	+0.1 -0.1	+0.1 -0.0	+0.1 -0.0	±0.1	±0.10	+0.1 -0.1	±0.1	±0.1	±0.1	±0.05

Reel
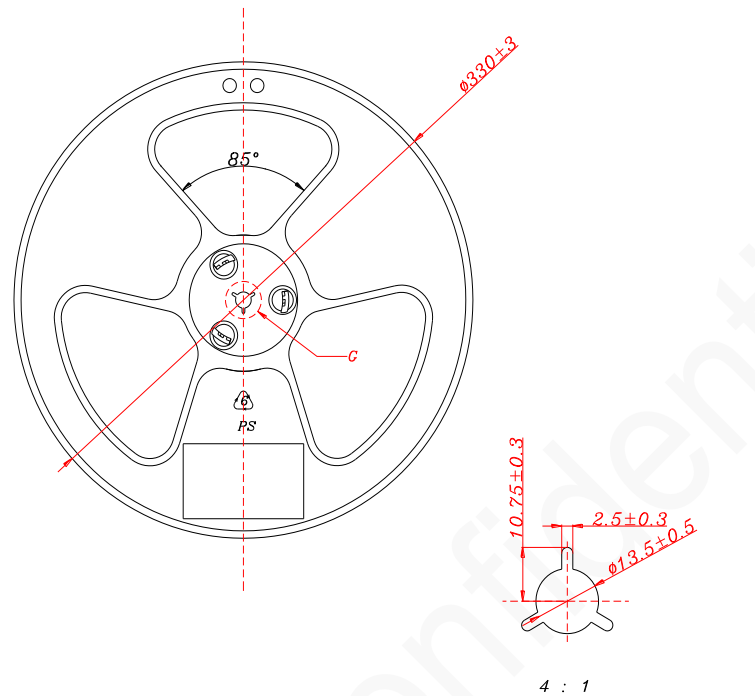
6.3.2 Moisture

N75 is a level 3 moisture-sensitive electronic elements, in compliance with IPC/JEDEC J-STD-020 standard.

If the module is exposed to air for more than 48 hours at conditions not worse than 30°C/60% RH, bake it at a temperature higher than 90°C for more than 12 hours before SMT. Or, if the indication card shows humidity greater than 20%, the baking procedure is also required. Do not bake modules with the package tray directly.

7 Mounting N75 onto Application Board

N75 is introduced in the 100-pin LGA package. This chapter describes N75V5 footprint, recommended PCB design and SMT information to guide users on how to mount the module onto an application PCB board.

7.1 Bottom Dimensions

Figure 7-1 Bottom view

7.2 Application Foot Print
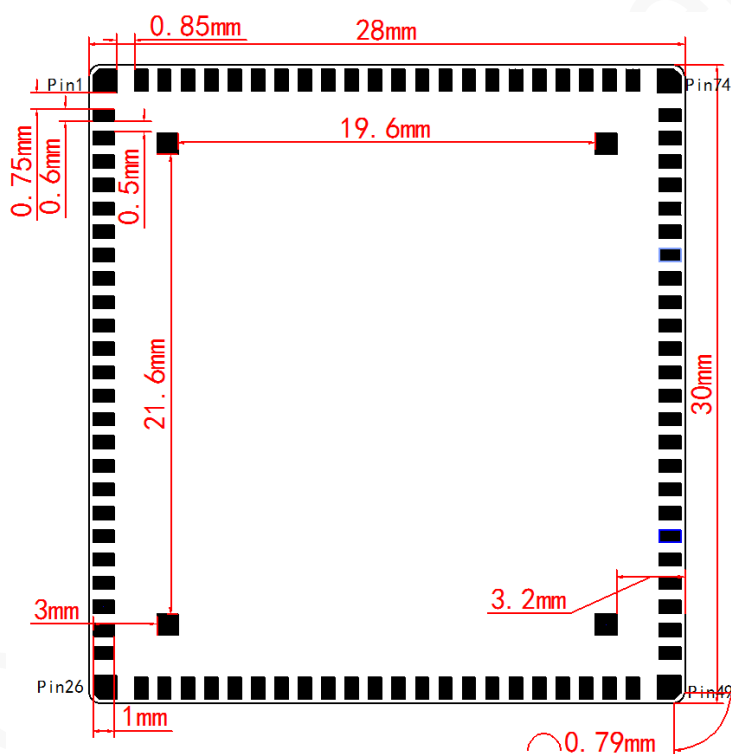
Figure 7-2 Recommended Application Foot Print (Top View)

7.3 Stencil

The recommended stencil thickness is at least 0.12 mm to 0.15 mm.

7.4 Solder Paste

The quality of the solder joint depends on the solder paste volume and the PCB flatness.

Do not use the kind of solder paste different from our module technique.

- The melting temperature of solder paste with lead is 35°C lower than that of solder paste without lead. It is easy to cause voiding for LGA and LCC inside the module after reflow soldering for the second time.

- When using only solder pastes with lead, please ensure that the reflow temperature is kept at 220°C for more than 45 seconds and the peak temperature reaches 240°C.

7.5 SMT Furnace Temperature Curve

Thin or long PCB might bend during SMT. So, use loading tools during the SMT and reflow soldering process to avoid poor solder joint caused by PCB bending.

Figure 7-3 SMT furnace temperature curve
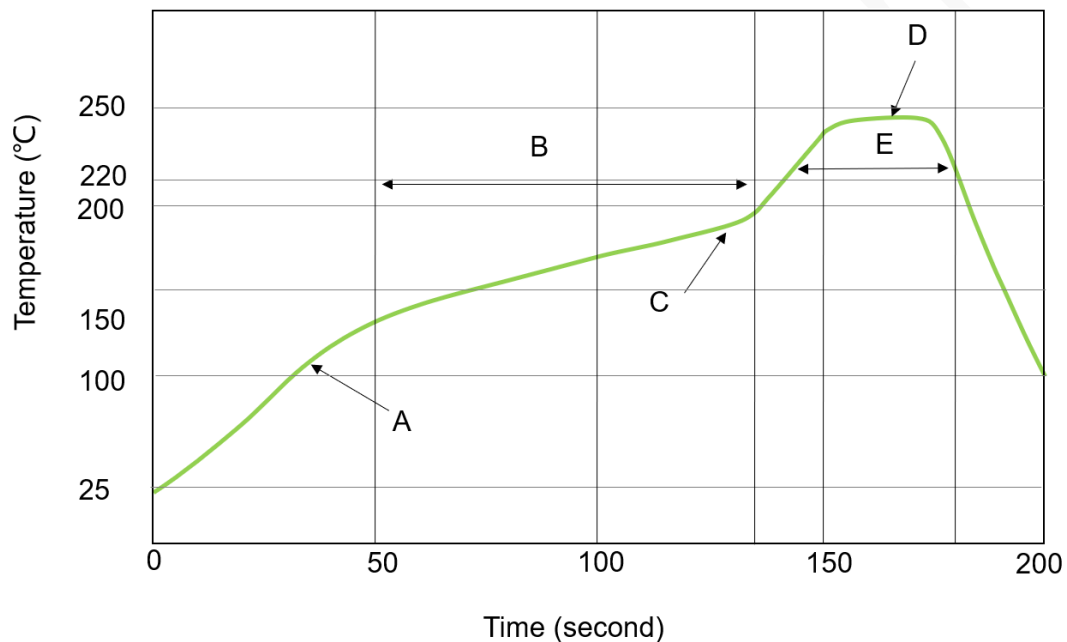
Technical parameters:

- Ramp up rate: 1 to 4°C /sec

- Ramp down rate: -3 to -1°C /sec

- Soaking zone: 150-180°C, Time: 60-100 s

- Reflow zone: >220°C, Time: 40-90 s

- Peak temperature: 235-245°C

> ⚠ Neoway will not provide a warranty for heat-responsive element abnormalities caused by improper temperature control.

For information about cautions in N75 storage and mounting, refer to *Neoway Module Reflow Manufacturing Recommendations*.

When manually desoldering the module, use heat guns with great opening, adjust the temperature to 245°C (depending on the type of the solder paste), and heat the module till the solder paste is melt. Then remove the module using tweezers. Do not shake the module in high temperatures while removing it. Otherwise, the components inside the module might get misplaced.

8 Safety Recommendations

Ensure that this product is used in compliance with the requirements of the country and the environment. Please read the following safety recommendations to avoid body hurts or damages of product or workplace:

- Do not use this product at any places with a risk of fire or explosion such as gasoline stations, oil refineries, etc.

- Do not use this product in environments such as hospitals or airplanes where it might interfere with other electronic equipment.

Please follow the requirements below in application design:

- Do not disassemble the module without permission from Neoway. Otherwise, we are entitled to refuse to provide further warranty.

- Please design your application correctly by referring to the HW design guide document and our review feedback on your PCB design. Please connect the product to a stable power supply and layout traces following fire safety standards.

- Please avoid touching the pins of the module directly in case of damages caused by ESD.

- Do not remove the USIM card in idle mode if the module does not support hot-swapping.

A Conformity and Compliance

A.1 Approvals

- FCC
- PTCRB
- AT&T*
- CE-R*
- GCF*
- RoHS*
- NCC*
- RCM*

A.2 American Notice

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.

A.2.1 Modify

Changes or modifications made to this equipment, not expressly approved by us or parties authorized by us could void the user's authority to operate the equipment.

A.2.2 FCC Class A Digital Device Notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial environment. 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. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

A.2.3 FCC Class B Digital Device Notice

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 or more 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.

B Abbreviation

Abbreviation	English Full Name
ADC	Analog-Digital Converter
bps	Bits per second
BLSP	BAM low-speed peripheral
DC-HSPA+	Dual-carrier HSPA+
EDGE	Enhanced GSM
EV-DO	Evolution-Data Optimized
FDD	Frequency Division Duplex
GNSS	Global Navigation Satellite System
GPIO	General-Purpose Input/Output
GPRS	General Packet Radio Service
HSPA+	High-Speed Packet Access
I2C	Interintegrated Circuit
I2S	Inter-IC Sound
LGA	Land Grid Array
LTE	Long-Term Evolution
MDIO	Management Data Input/Output
PCB	Printed Circuit Board
PCM	Pulse-Coded Modulation
PM	Power management unit
RF	Radio Frequency
SDC	Secure Digital Controller
SGMII	Serial Gigabit Media Independent Interface
SPI	Serial Peripheral Interface
TD-SCDMA	Time Division-Synchronous Code Division Multiple Access
UART	Universal asynchronous receiver-transmitter
USIM	Universal Subscriber Identity Module
UMTS	Universal Mobile Telecommunications System

USB	Universal Serial Bus
USB-OTG	Universal serial bus on-the-go
WCDMA	Wide-band Code Division Multiple Access
WCI	Wireless Coexistence Interface
WLAN	Wireless Local Area Network