

N11

# Product Specifications

Issue 1.3

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Neoway Product Document



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## Notice

This document provides guide for users to use N11.

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 N11 series.

It defines the features, indicators, and test standards of the N11 module and provides reference for the hardware design of each interface.


## Audience

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

## Change History

| Issue | Date    | Change  | Changed By     |
|-------|---------|---|----------------|
| 1.0   | 2018-03 | Initial draft   | Wang Qiang     |
| 1.1   | 2018-03 | Modified the signal   | Zhuo JianZheng |
| 1.2   | 2018-09 | Added N11 V2  | Zhuo JianZheng |
| 1.3   | 2019-06 | <ul style="list-style-type: none"><li>Modified the supply voltage</li><li>Deleted CSD</li><li>Updated Section 5.3</li></ul> | Gong Hualiang  |

## Conventions

| Symbol   | Indication   |
|--|--|
| <br>Warning | 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

## Related Documents

Neoway\_N11\_Datasheet

Neoway\_N11\_Hardware\_User\_Guide

Neoway\_N11\_AT\_Command\_Mannual

Neoway\_N11\_EVK\_User\_Guide

# 1 About N11

N11 is a compact wireless GSM/GPRS module. It provides high-quality SMS and data services. N11 is widely used in industrial and consumer applications.

N11 series include two variants: N11 and N11 V2. These two variants are completely compatible with each other in pin definition, packaging, and electric feature. In this document, N11 refers to both variants if there is additional note.

## 1.1 Overview

The N11 module adopts 20-pin LGA package and its dimensions are 15.8 mm x 13.8 mm x 2.5 mm, which can meet most customer requirements for space reduction. It has the following hardware resources and features:

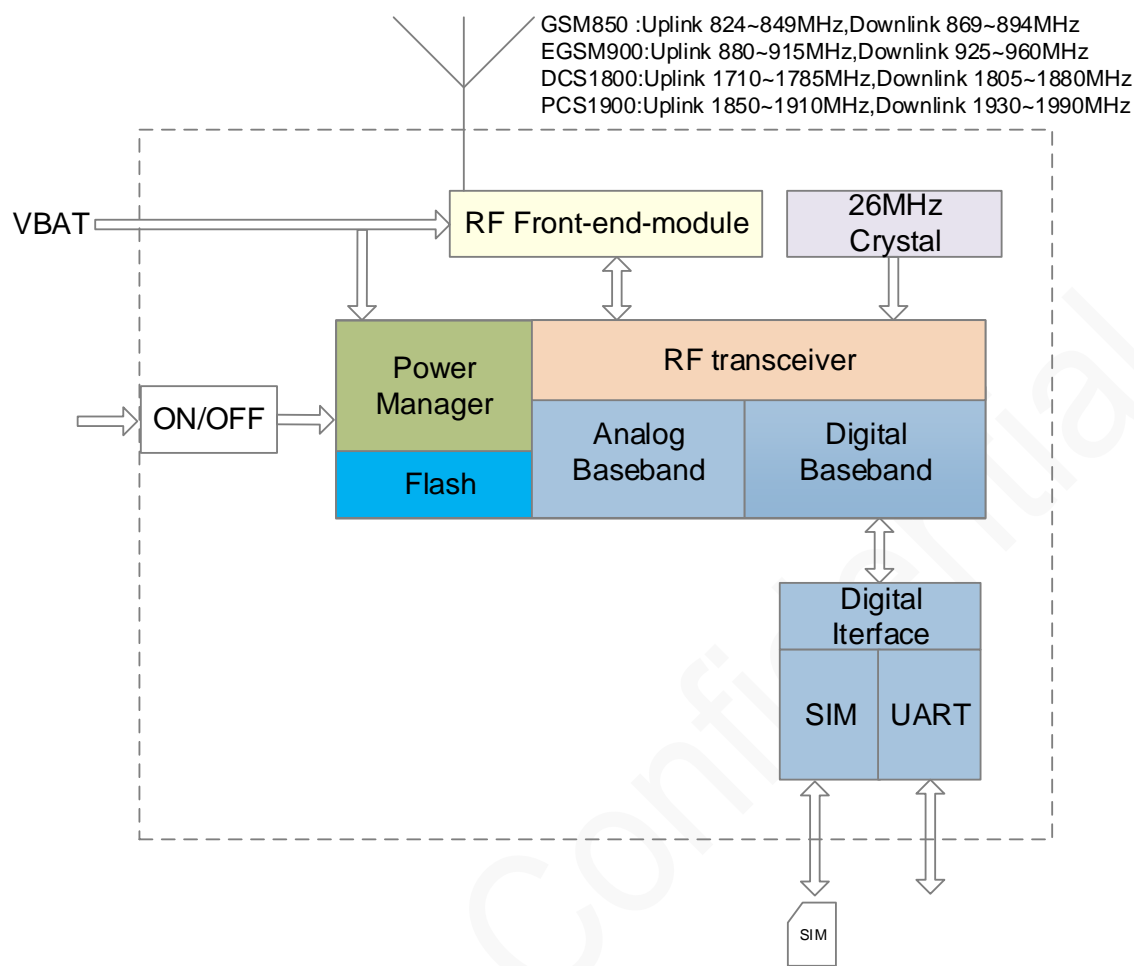
- UART interface, used for data communications, software upgrades and debugging
- Support SIM card 1.8/3.0V self-adaption
- Support RING (incoming call and SMS reminder)/NET\_LIGHT//LIGHT (work indicator)/DTR (sleep mode) function

## 1.2 Block Diagram

The N11 module consists of baseband controller, Flash ROM, RF section, application interfaces, etc. All sections coordinate with each other to provide such communication functions as GPRS data. Its design block diagram is shown in Figure 1-1.



Figure 1-1 N11 Block Diagram



1.3 Specifications

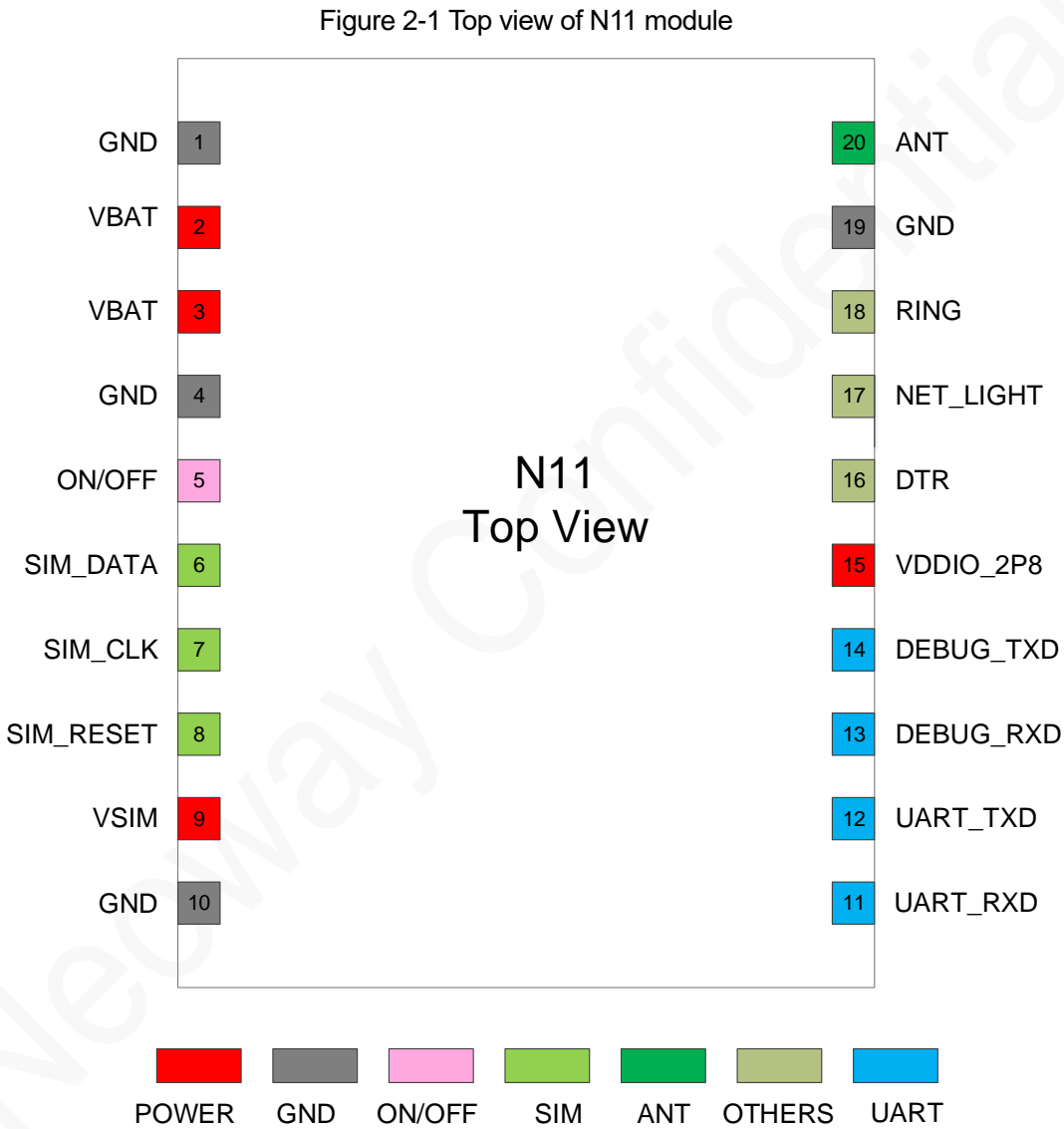
Table 1-1 N11 Specifications

| Specifications           | Description   |
|--------------------------|---|
| Dimensions               | (15.8±0.1) mm x (13.8±0.1) mm x (2.5±0.2) mm (H x W x D)                      |
| Weight                   | 1.3 g   |
| Package                  | 20-pin LGA  |
| Operating Temperature    | -40 °C to +85 °C  |
| Operating Voltage        | 3.4 V to 4.3 V (3.9 V is recommended)   |
| Peak Current             | Max 2.0 A   |
| Operating Current (Idle) | 11 mA   |
| Current in Sleep Mode    | <ul style="list-style-type: none"><li>&lt; 2.5 mA (on live network)</li></ul> |

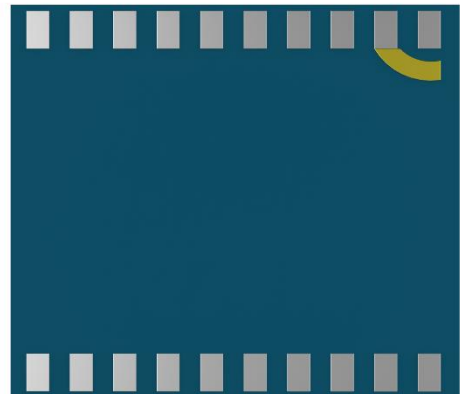
|                 |   |
|-----------------|---|
|                 | <ul style="list-style-type: none"><li>&lt; 1.1 mA (through instrument, DRX=9)</li></ul>   |
| Frequency band  | GSM850/EGSM900/DCS1800/PCS1900  |
| Sensitivity     | < -108 dBm  |
| Transmit power  | <ul style="list-style-type: none"><li>GSM850/EGSM900 Class4(2W)</li><li>DCS1800/PCS1900 Class1(1W)</li></ul>  |
| Protocol        | Support GSM/GPRS Phase2/2+  |
| AT commands     | <ul style="list-style-type: none"><li>GSM07.07</li><li>Extended AT commands</li></ul>   |
| SMS             | <ul style="list-style-type: none"><li>Support PDU and TEXT mode</li><li>Support SMS message receiving and sending and alert for new SMS messages</li><li>Support SMS message management: reading/deleting/storage/list</li></ul>  |
| GPRS Features   | <ul style="list-style-type: none"><li>Support GPRS CLASS 12</li><li>Theoretical maximum uplink transmission rate: 85.6 Kbit/s</li><li>Theoretical maximum downlink transmission rate: 85.6 Kbit/s</li><li>Embedded TCP/IP protocol, support multi-link</li><li>Support server and client mode</li></ul> |
| UART            | <ul style="list-style-type: none"><li>Support AT command sending, data transmission and firmware download</li><li>Support baud rate from 9600 bit/s to 115200 bit/s</li></ul>   |
| Antenna Feature | 50 Ω characteristic impedance   |

## 2 Pin Description

### 2.1 Pin Allocation



## 2.2 Appearance



## 3 Electric Features and Reliability

### 3.1 Electric Feature

Table 3-1 Electric feature of the module

| Parameter |      | Minimum Value | Typical Value | Maximum Value |
|-----------|------|---------------|---------------|---------------|
| VBAT      | Vin  | 3.4 V         | 3.9 V         | 4.3 V         |
|           | Iin  | /             | /             | 2 A           |
| DIO       | Vout | 2.3 V         | 2.8 V         | 3.1 V         |
|           | Iout | /             | /             | 4 mA          |
|           | Vin  | -0.3 V        | 0 V           | 0.6 V         |
|           | Iin  | /             | /             | 22.5 $\mu$ A  |



Caution

If the voltage is too low, the module might fail to start. If the voltage is too high or there is a voltage burst during the startup, the module might be damaged permanently.

If LDO or DC-DC is used to supply power for the module, ensure that it output at least 2 A current.

### 3.2 Temperature

Table 3-2 Temperature Feature

| Module Status | Minimum Value | Typical Value | Maximum Value |
|---------------|---------------|---------------|---------------|
| Working       | -40 °C        | 25 °C         | 85 °C         |
| Storage       | -45 °C        |               | 90 °C         |



Caution

If the module works in temperature exceeding the thresholds, its RF performance (e.g. frequency deviation or phase deviation) might be worse but it can still work properly.

### 3.3 Current

Table 3-3 Current feature

| Parameter                         | Testing Conditions   | Testing Result<br>(Average Current) |
|-----------------------------------|--|-------------------------------------|
| Testing voltage                   | 3.9 V Agilent power supply   | /                                   |
| Idle mode                         | Set the instrument and power on the module.  | 11 mA                               |
| Off leakage current               | Power on the module or use AT command to shut the module down.                           | 170 $\mu$ A                         |
| Average network searching current | Set the instrument.<br>Start the module. Wait until the module registers the instrument. | 50 mA                               |
| Sleep mode                        | On a live network, the module registers the network and then enters the sleep mode.      | 2.4 mA                              |
|                                   | Set the instrument properly (DRX=9)  | 1.1 mA                              |
| Voice service                     | Maximum power level in full rate mode  | GSM850 194 mA                       |
|                                   |  | EGSM900 185 mA                      |
|                                   |  | DCS1800 135 mA                      |
|                                   |  | PCS1900 126mA                       |
| GPRS class 12                     | 4TX, 1RX (4Up/1Down)   | GSM850 435 mA                       |
|                                   |  | EGSM900 397 mA                      |
|                                   |  | DCS1800 268 mA                      |
|                                   |  | PCS1900 242 mA                      |
|                                   | 1TX, 4RX (1Up/4Down)   | GSM850 184 mA                       |
|                                   |  | EGSM900 170 mA                      |
|                                   |  | DCS1800 122 mA                      |
|                                   |  | PCS1900 117 mA                      |



Caution

The data in the above table is typical values obtained during tests in lab. It might be a little bit different in manufacturing. Also, the test results might be various due to different settings or testing methods.

## 3.4 ESD Protection

Electronics need to pass sever ESD tests. The following table shows the ESD capability of key pins of our module. Add ESD protection to those pins in accordance to the application to ensure product quality when designing better products.

Humidity: 45%

Temperature: 25 °C

Table 3-4 ESD feature of the module

| 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        |
| UART_RXD/UART_TXD | ±4 kV             | ±8 kV         |
| Others            | ±4 kV             | ±8 kV         |

## 4 RF Features

### 4.1 Operating Band

Table 4-1 Operating band

| 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 |

### 4.2 Transmitting Power and Receiving Sensitivity

#### 4.2.1 Transmitting Power

Table 4-2 Transmitting power (GSM800&amp;EGSM900)

| PCL | Transmitting Power | Threshold Range |
|-----|--------------------|-----------------|
| 5   | 33 dBm             | ±2 dBm          |
| 6   | 31 dBm             | ±3 dBm          |
| 7   | 29 dBm             | ±3 dBm          |
| 8   | 27 dBm             | ±3 dBm          |
| 9   | 25 dBm             | ±3 dBm          |
| 10  | 23 dBm             | ±3 dBm          |
| 11  | 21 dBm             | ±3 dBm          |
| 12  | 19 dBm             | ±3 dBm          |
| 13  | 17 dBm             | ±3 dBm          |
| 14  | 15 dBm             | ±3 dBm          |



|    |        |        |
|----|--------|--------|
| 15 | 13 dBm | ±5 dBm |
| 16 | 11 dBm | ±5 dBm |
| 17 | 9 dBm  | ±5 dBm |
| 18 | 7 dBm  | ±5 dBm |
| 19 | 5 dBm  | ±5 dBm |

Table 4-3 Transmitting power (DCS1800&amp;PCS1900)

| PCL | Transmitting Power | Threshold Range |
|-----|--------------------|-----------------|
| 0   | 30 dBm             | ±2 dBm          |
| 1   | 28 dBm             | ±3 dBm          |
| 2   | 26 dBm             | ±3 dBm          |
| 3   | 24 dBm             | ±3 dBm          |
| 4   | 22 dBm             | ±3 dBm          |
| 5   | 20 dBm             | ±3 dBm          |
| 6   | 18 dBm             | ±3 dBm          |
| 7   | 16 dBm             | ±3 dBm          |
| 8   | 14 dBm             | ±3 dBm          |
| 9   | 12 dBm             | ±3 dBm          |
| 10  | 10 dBm             | ±4 dBm          |
| 11  | 8 dBm              | ±4 dBm          |
| 12  | 6 dBm              | ±4 dBm          |
| 13  | 4 dBm              | ±4 dBm          |
| 14  | 2 dBm              | ±5 dBm          |
| 15  | 0 dBm              | ±5 dBm          |

## 4.2.2 Receiving Sensitivity

| Band            | Typical   |
|-----------------|-----------|
| GSM800&EGSM900  | <-108 dBm |
| DCS1800&PCS1900 | <-108 dBm |



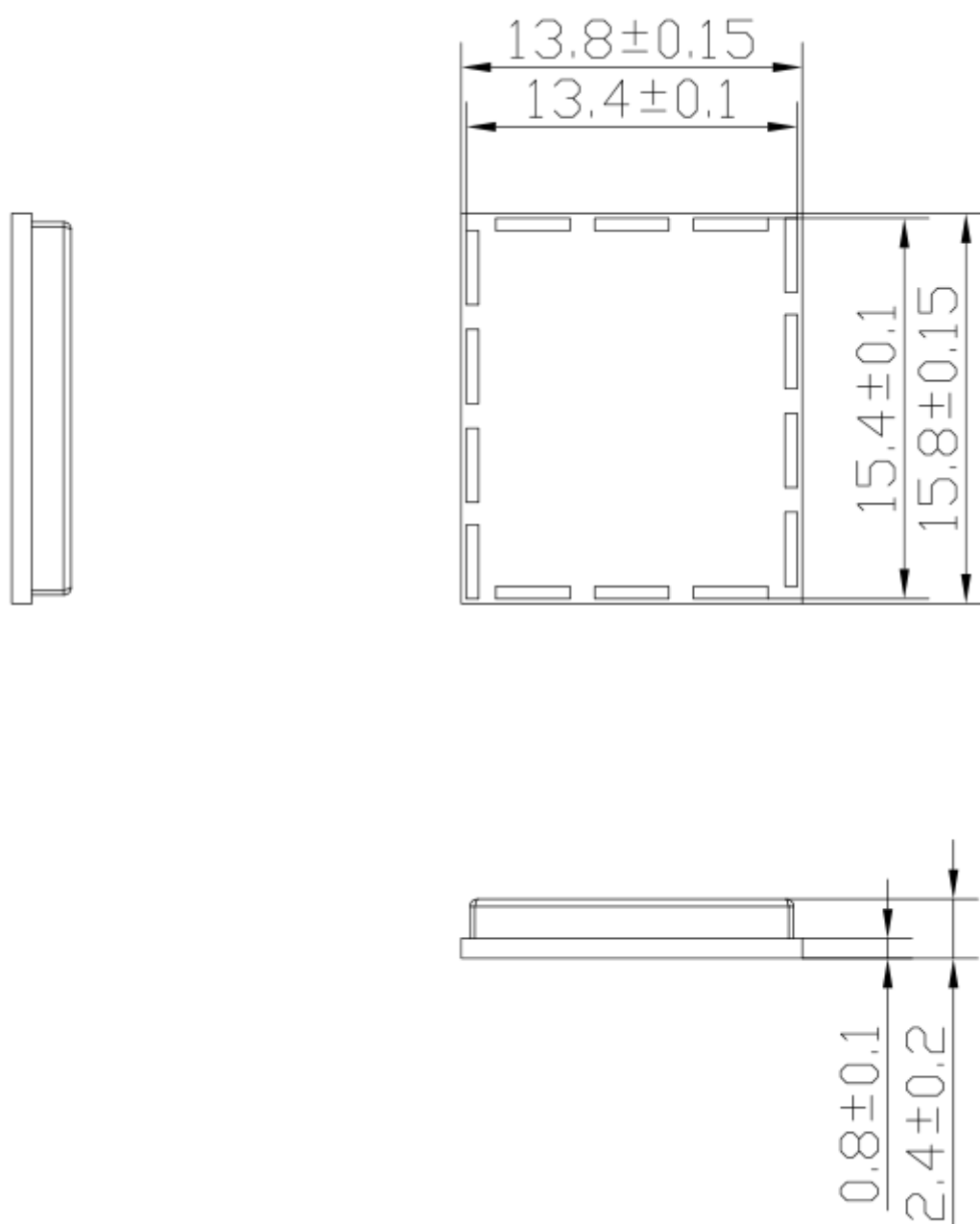
Note

The data in the above tables is obtained by connecting the module to RF test instrument (e.g. CMU200, CWM500, or Agilent8960) in lab tests. It is for reference only.

## 5 Mechanical Features

### 5.1 Dimensions

Figure 5-1 N1 dimensions (Unit: mm)



## 5.2 Label

Figure 5-2 N11 label



Figure 5-3 N11V2 label

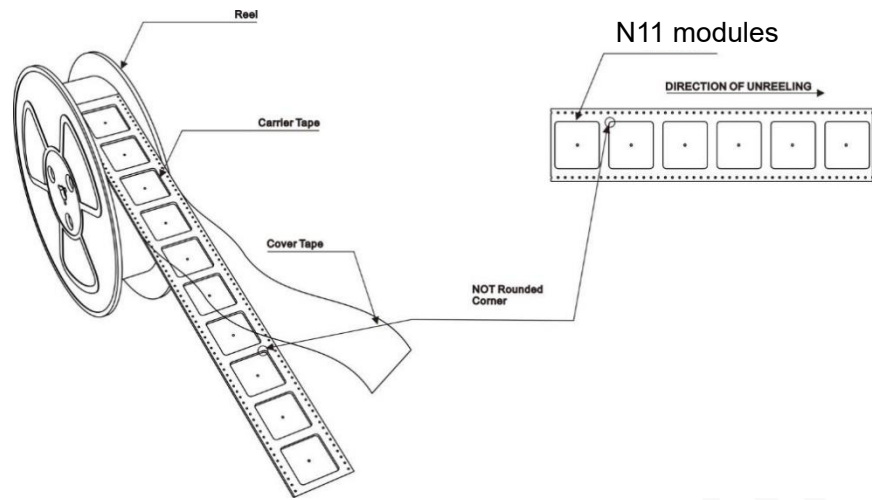


## 5.3 Package

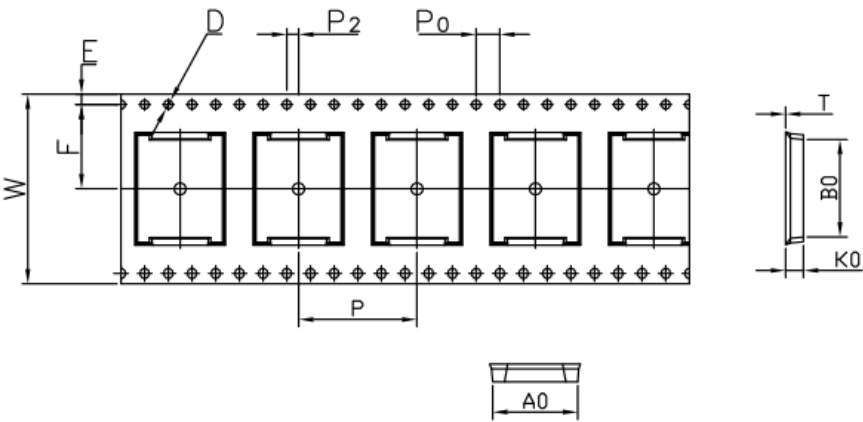
N11 modules are packed in sealed bags on delivery to guarantee a long shelf life. Follow the same package of the modules again in case of opened for any reasons.

5.3.1 Tape & Reel Packaging

N11 in mass production are shipped in the following package.

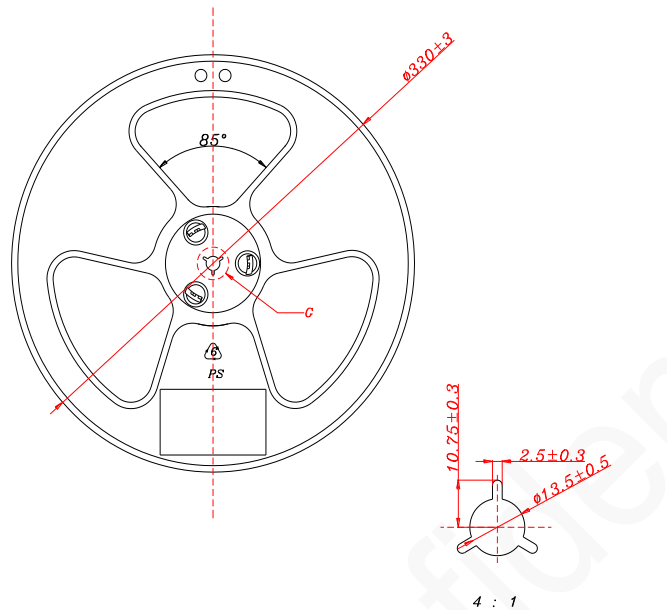


Tape



| ITEM | W                                      | A <sub>0</sub>                         | B <sub>0</sub>                         | K <sub>0</sub>                         | K <sub>1</sub>                         | P                                      | F                                      | E                                      | D                                      | D <sub>1</sub>                         | P <sub>0</sub>                         | P <sub>2</sub>                         |
|------|--|--|--|--|--|--|--|--|--|--|--|--|
| DIM  | 32.0 <sup>+0.30</sup> <sub>-0.10</sub> | 14.3 <sup>+0.10</sup> <sub>-0.10</sub> | 16.4 <sup>+0.10</sup> <sub>-0.10</sub> | 3.30 <sup>+0.10</sup> <sub>-0.10</sub> | 0.00 <sup>+0.10</sup> <sub>-0.10</sub> | 20.0 <sup>+0.10</sup> <sub>-0.10</sub> | 14.2 <sup>+0.10</sup> <sub>-0.10</sub> | 1.75 <sup>+0.10</sup> <sub>-0.10</sub> | 1.50 <sup>+0.10</sup> <sub>-0.00</sub> | 0.00 <sup>+0.25</sup> <sub>-0.00</sub> | 4.00 <sup>+0.10</sup> <sub>-0.10</sub> | 2.00 <sup>+0.10</sup> <sub>-0.10</sub> |

## Reel



## 5.3.2 Moisture

N11 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  $30^\circ\text{C}/60\% \text{ RH}$ , bake it at a temperature higher than  $90^\circ\text{C}$  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 reel tray directly.

## 5.4 Storage

N11 should be stored in the following conditions:

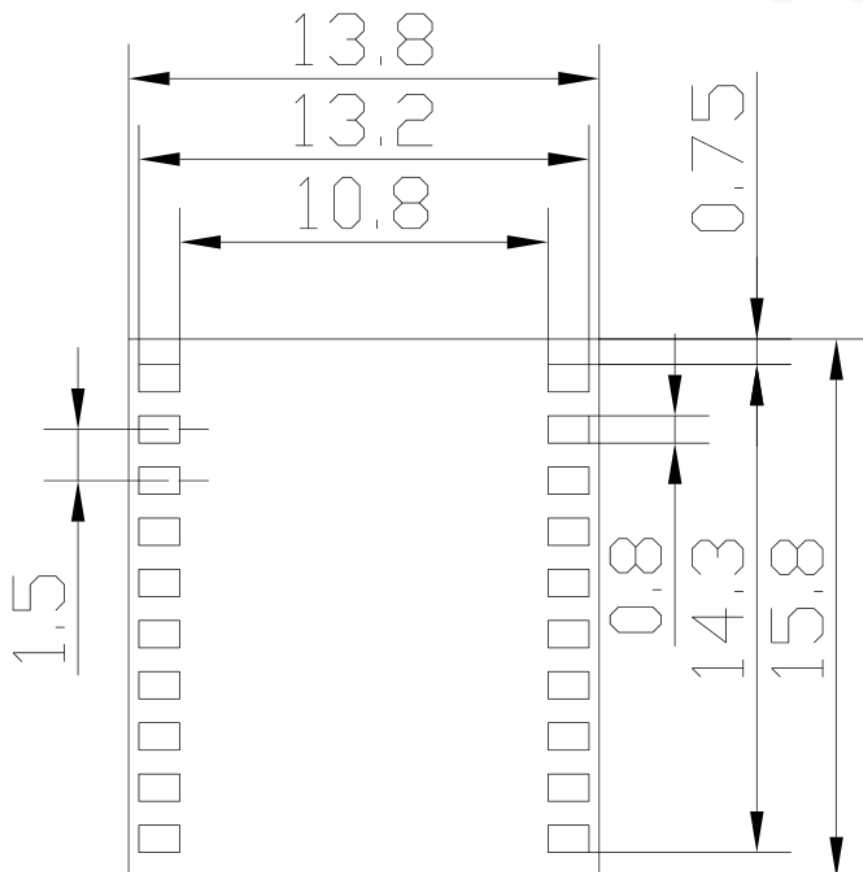
- Temperature:  $20^\circ\text{C}$  to  $26^\circ\text{C}$
- Humidity: 40% to 60%
- Period: 120 days

## 6 Mounting N11 onto the Application Board

N11 is introduced in 20-pin LGA package. This chapter describes N11 foot print, recommended PCB design and SMT information to guide users how to mount the module onto application PCB board.

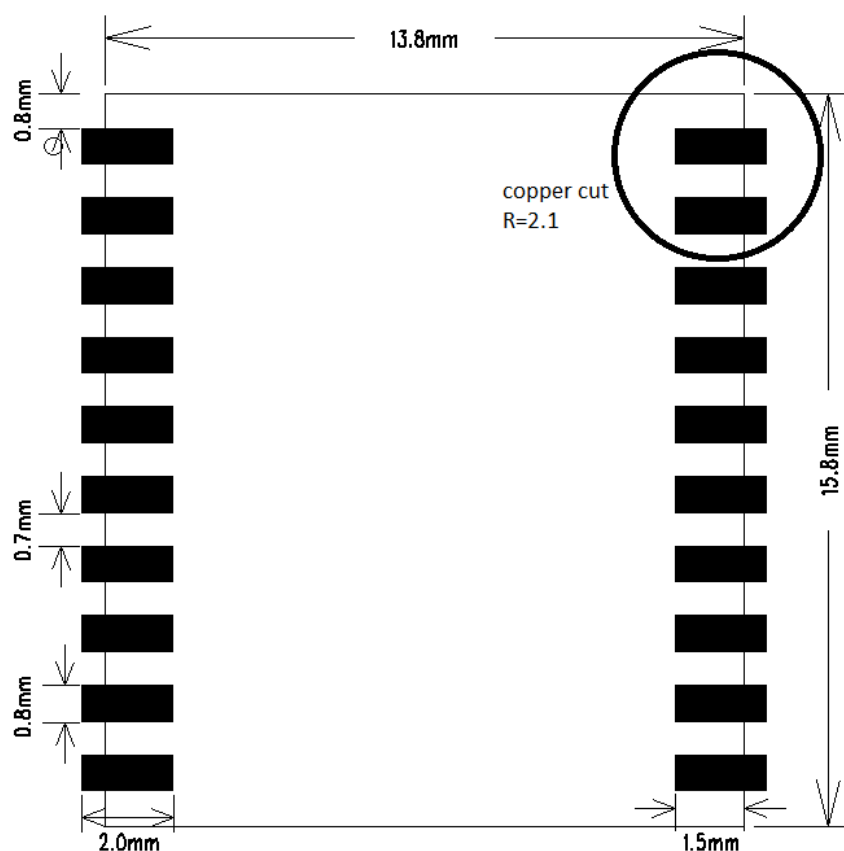
### 6.1 Bottom Dimensions

Figure 6-1 N11 bottom dimensions (Unit: mm)



## 6.2 Application Foot Print

Figure 6-2 Recommended PCB foot print (Unit: mm)



## 6.3 Stencil

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

## 6.4 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.

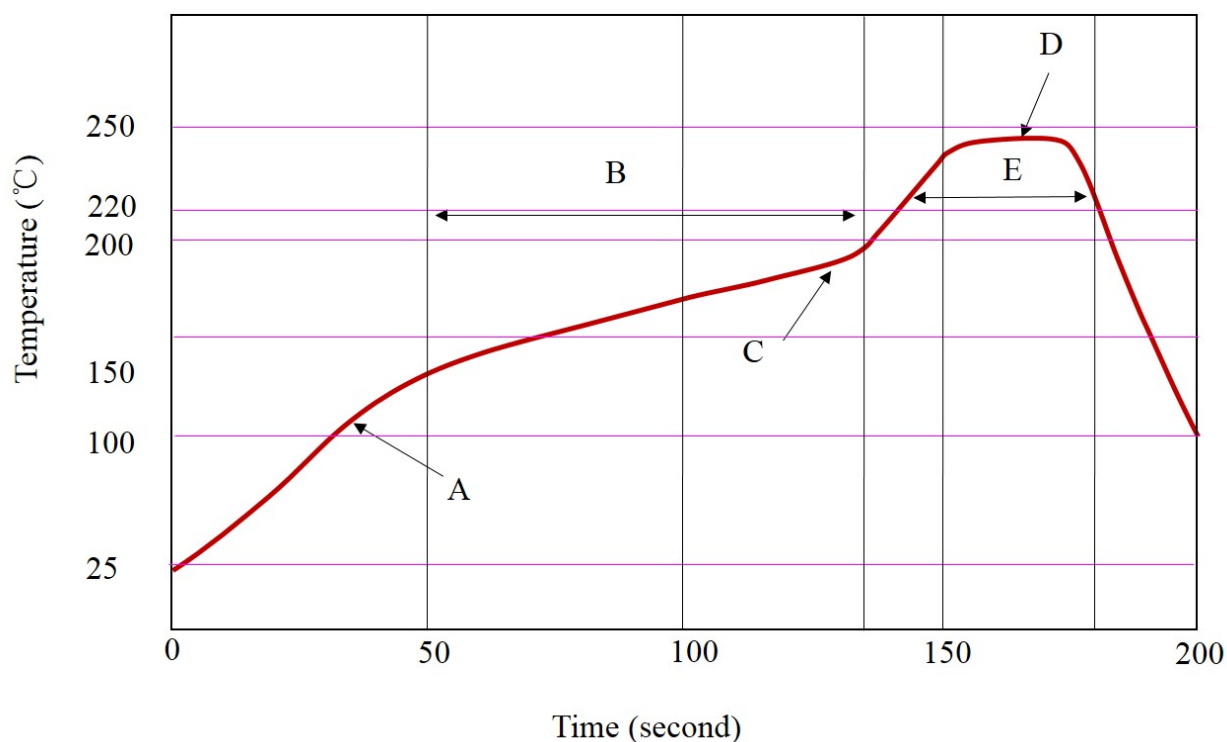
- The melting temperature of solder paste with lead is 35 °C lower than that of solder paste without lead. It is easy to cause voiding for LGA and LCC inside the module after second reflow soldering.
- When using only solder pastes with lead, please ensure that the reflow temperature is kept at 220 °C for more than 45 seconds and the peak temperature reaches 240 °C.



## 6.5 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 6-3 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



Warning

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

For information about cautions in N11 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 degrees (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.

## 7 Safety Recommendations

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

- 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 hospital or airplane 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 lay out traces following fire safety standards.
- Please avoid touch 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 plugging.