

# N11 Series

## Product Specifications

Issue 1.4 Date 2019-10-15



**Copyright © Neoway Technology Co., Ltd 2019. All rights reserved.**

No part of this document may be reproduced or transmitted in any form or by any means without prior written consent of Neoway Technology Co., Ltd.

**neoway** is the trademark of Neoway Technology Co., Ltd.

All other trademarks and trade names mentioned in this document are the property of their respective holders.

**Notice**

This document provides a guide for users to use the N11 Series.

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

THIS GUIDE PROVIDES INSTRUCTIONS FOR CUSTOMERS TO DESIGN THEIR APPLICATIONS. PLEASE FOLLOW THE RULES AND PARAMETERS IN THIS GUIDE TO DESIGN AND COMMISSION. NEOWAY WILL NOT TAKE ANY RESPONSIBILITY OF BODILY HURT OR ASSET LOSS CAUSED BY IMPROPER OPERATIONS.

THE INFORMATION IN THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE DUE TO PRODUCT VERSION UPDATE OR OTHER REASONS.

EVERY EFFORT HAS BEEN MADE IN PREPARATION OF THIS DOCUMENT TO ENSURE ACCURACY OF THE CONTENTS, BUT ALL STATEMENTS, INFORMATION, AND RECOMMENDATIONS IN THIS DOCUMENT DO NOT CONSTITUTE A WARRANTY OF ANY KIND, EXPRESS OR IMPLIED.

Neoway provides customers complete technical support. If you have any question, please contact your account manager or email to the following email addresses:

Sales@neoway.com

Support@neoway.com

**Website:** <http://www.neoway.com>

# Contents

<b>1 About N11</b> .....	<b>7</b>
1.1 Overview .....	7
1.2 Block Diagram .....	7
1.3 Specifications .....	8
<b>2 Pin Description</b> .....	<b>10</b>
2.1 Pin Allocation .....	10
2.2 Appearance .....	11
<b>3 Electric Features and Reliability</b> .....	<b>12</b>
3.1 Electric Feature .....	12
3.2 Temperature .....	12
3.3 Current .....	13
3.4 ESD Protection .....	14
<b>4 RF Features</b> .....	<b>15</b>
4.1 Operating Band .....	15
4.2 Transmitting Power and Receiving Sensitivity .....	15
4.2.1 Transmitting Power .....	15
4.2.2 Receiving Sensitivity .....	17
<b>5 Mechanical Features</b> .....	<b>18</b>
5.1 Dimensions .....	18
5.2 Labels .....	19
5.3 Package .....	19
5.3.1 Tape & Reel Packaging .....	20
5.3.2 Humidity-Sensitive .....	21
5.4 Storage .....	21
<b>6 Mounting N11 onto Application Board</b> .....	<b>22</b>
6.1 Bottom Dimensions .....	22
6.2 Application Footprint .....	23
6.3 Stencil .....	23
6.4 Solder Paste .....	23
6.5 SMT Profile .....	24
<b>7 Safety Recommendations</b> .....	<b>26</b>

## Table of Figures

Figure 1-1 N11 Block Diagram .....	8
Figure 2-1 Top view of N11 module.....	10
Figure 2-2 Top view of N11.....	11
Figure 2-3 Bottom view of N11 .....	11
Figure 5-1 N11 dimensions (Unit: mm) .....	18
Figure 5-2 N11 label.....	19
Figure 5-3 N11 V2 label.....	19
Figure 6-1 N11 bottom dimensions (Unit: mm) .....	22
Figure 6-2 Recommended PCB footprint (Unit: mm).....	23
Figure 6-3 SMT furnace temperature curve.....	24

## Table of Tables

Table 1-1 N11 Specifications.....	8
Table 3-1 Electric feature of the module .....	12
Table 3-2 Temperature Feature.....	12
Table 3-3 Current feature .....	13
Table 3-4 ESD feature of the module.....	14
Table 4-1 Operating band.....	15
Table 4-2 Transmitting power (GSM850&EGSM900).....	15
Table 4-3 Transmitting power (DCS1800&PCS1900).....	16

# About This Document

## Scope

This document is applicable to the N11 Series.

It defines the features, indicators, and test standards of the N11 Series 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
1.4	2019-06	Updated figures in 2.2	Gong Hualiang

## Conventions

Symbol	Indication
	This warning symbol means danger. You are in a situation that could cause fatal device damage or even bodily damage.
	This 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\_N11 Series\_Datasheet*

*Neoway\_N11 Series\_Product\_Specifications*

*Neoway\_N11 Series\_AT\_Command\_Manual*

*Neoway\_N11 Series\_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 features. In this document, N11 refers to both variants if not specified.

## 1.1 Overview

The N11 module adopts a 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:

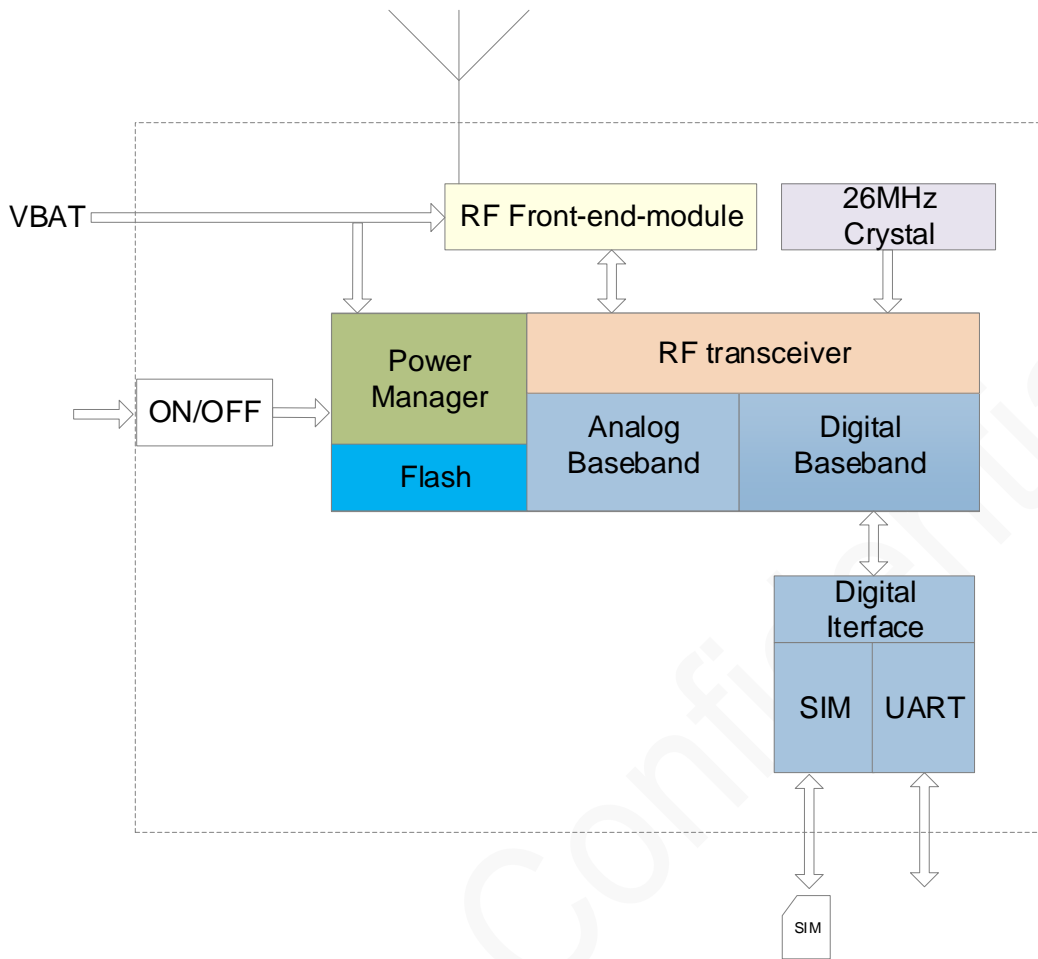
- UART interface, used for data communications, software upgrades and debugging
- Support SIM card 1.8/3.0V self-adaption
- Support RING (incoming call and SMS reminder)/NET\_LIGHT (network indicator)/DTR (sleep mode) function

## 1.2 Block Diagram

The N11 module consists of a 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> <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/sending and alerts 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 $\Omega$ characteristic impedance

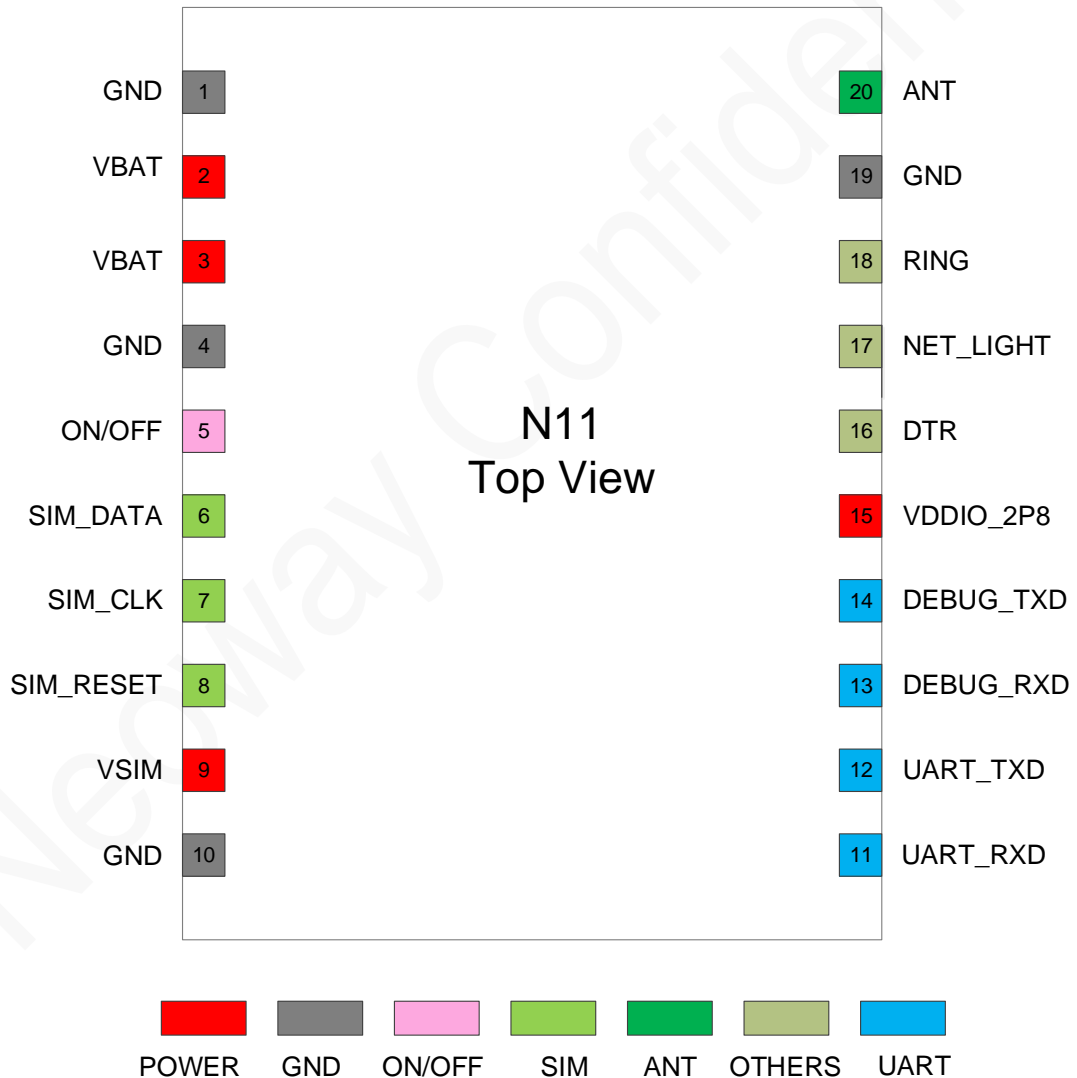
---

## 2 Pin Description

There are 20 pins on N11 and their pads are introduced in the LGA package. This chapter describes its pin definition and features.

### 2.1 Pin Allocation

Figure 2-1 Top view of N11 module

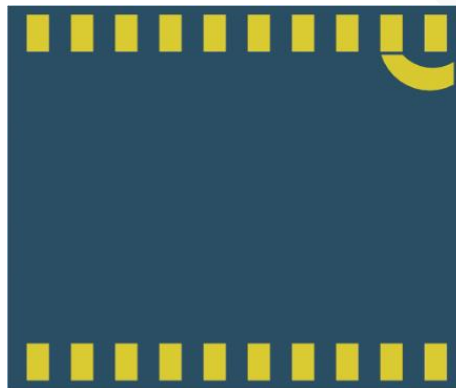


## 2.2 Appearance

Figure 2-2 Top view of N11



Figure 2-3 Bottom view of N11



The top view shows the label of N11. For the label of N11 V2, see 5.2.

## 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
VDDIO_2P8	Vout	/	2.8 V	/
	Iout	/	/	50 mA
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



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



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 (Average Current)	Result
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. 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.	<2.5 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



The data in the above table are typical values obtained during tests in the 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 severe ESD tests. The following table shows the ESD capability of key pins of our module. Add ESD protection to those pins in accordance with 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 (GSM850&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
GSM850&EGSM900	<-108 dBm
DCS1800&PCS1900	<-108 dBm

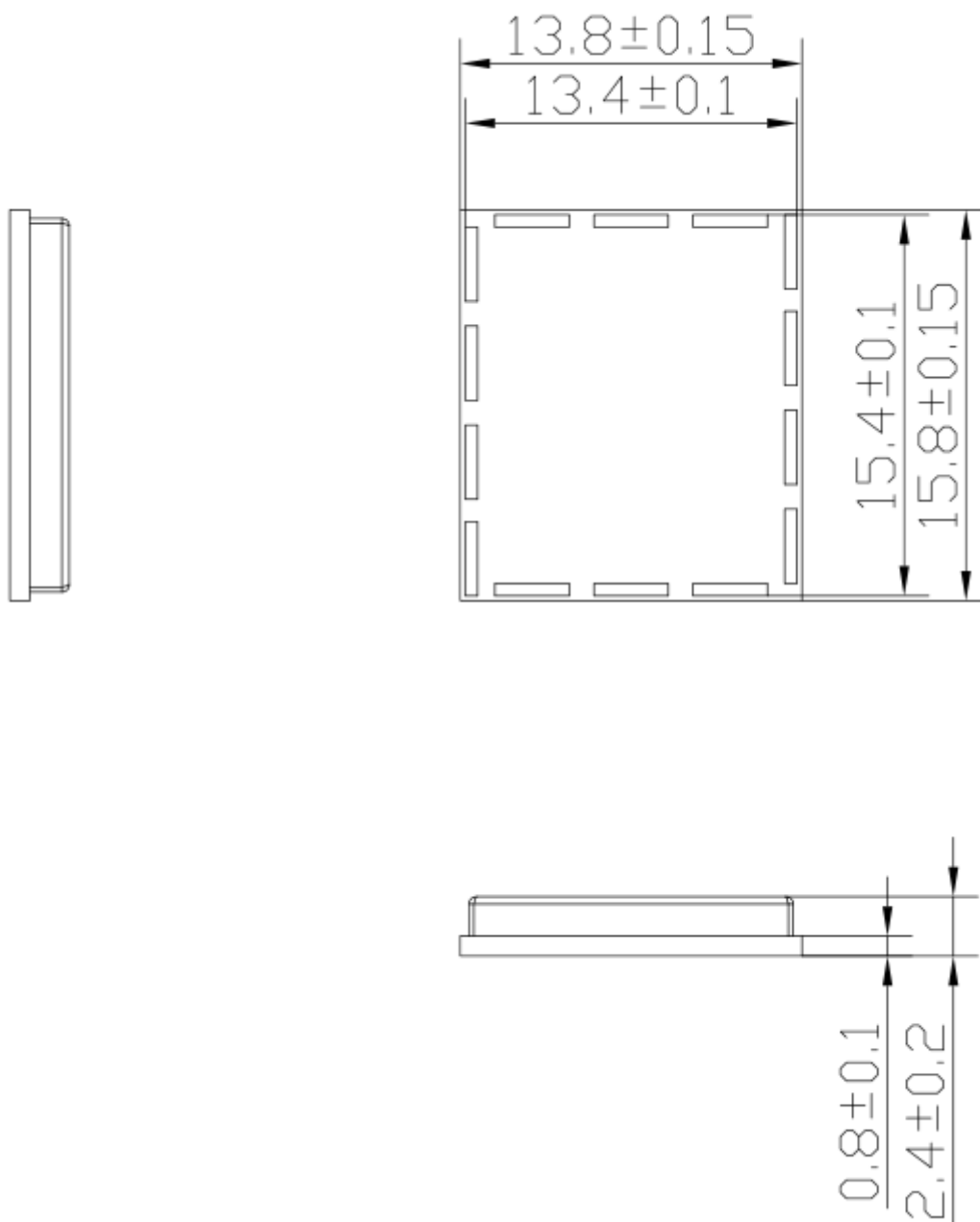


The data in the above tables is obtained by connecting the module to the RF test instrument (e.g. CMU200, CWM500, or Agilent8960) in lab tests. It is for reference only.

## 5 Mechanical Features

### 5.1 Dimensions

Figure 5-1 N11 dimensions (Unit: mm)



## 5.2 Labels

The label is made of materials that are deformation-resistant, fade-resistant, and high-temperature-resistant and it can endure high temperatures up to 260 °C.

Figure 5-2 N11 label



Figure 5-3 N11 V2 label



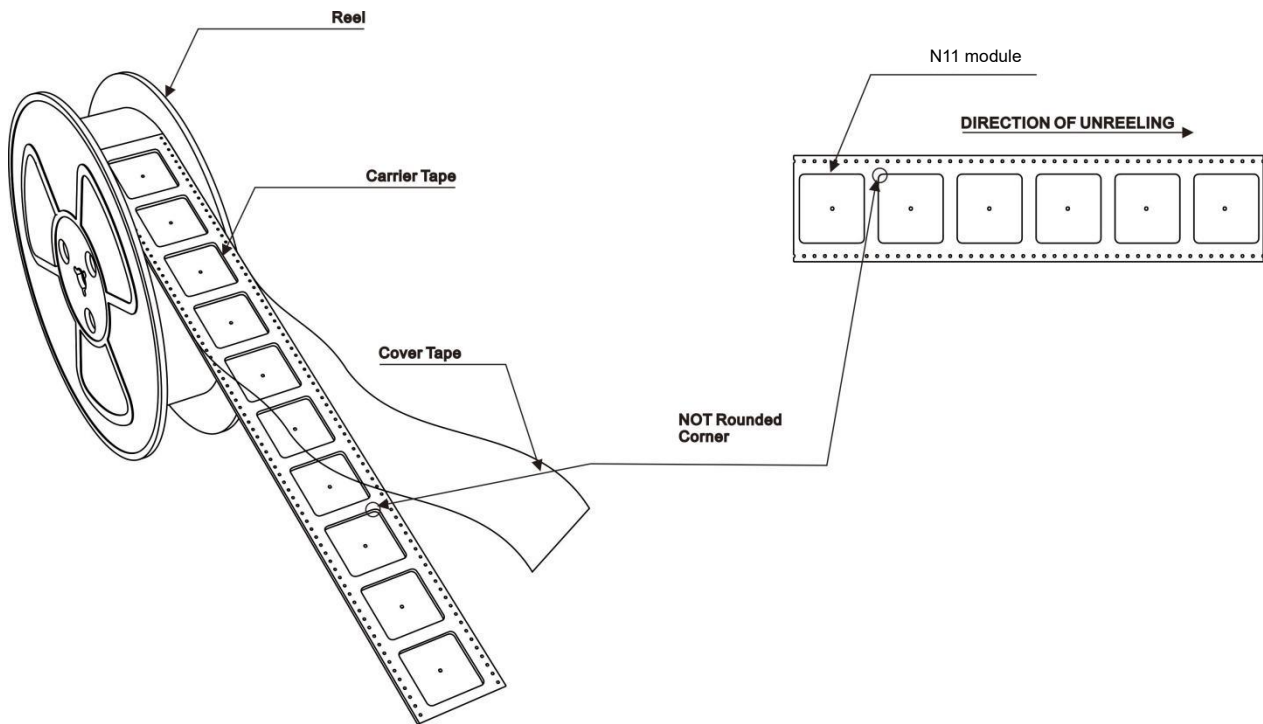
- The picture above is only for reference.
- The silk-screen printing must be clear. No blur is allowed.
- The material and surface finishing must comply with RoHS directives.

## 5.3 Package

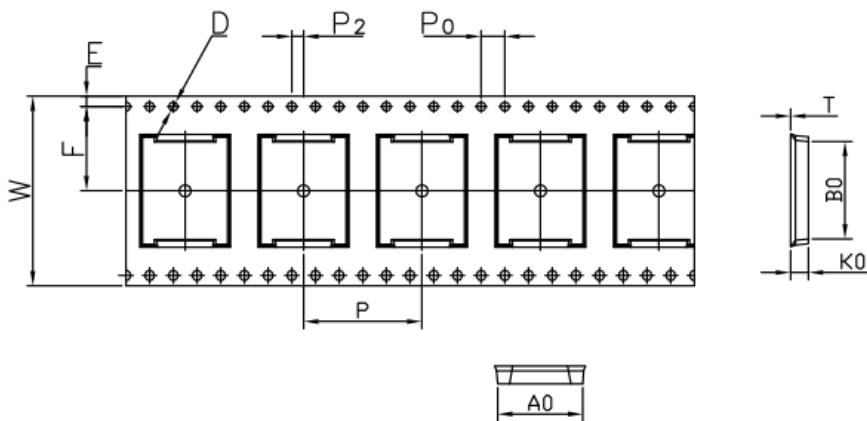
N11 modules are packed in sealed bags on delivery to guarantee a long shelf life. Follow the same package of the modules again in case of opened for any reason.

### 5.3.1 Tape & Reel Packaging

N11 in mass production is shipped in the following package.

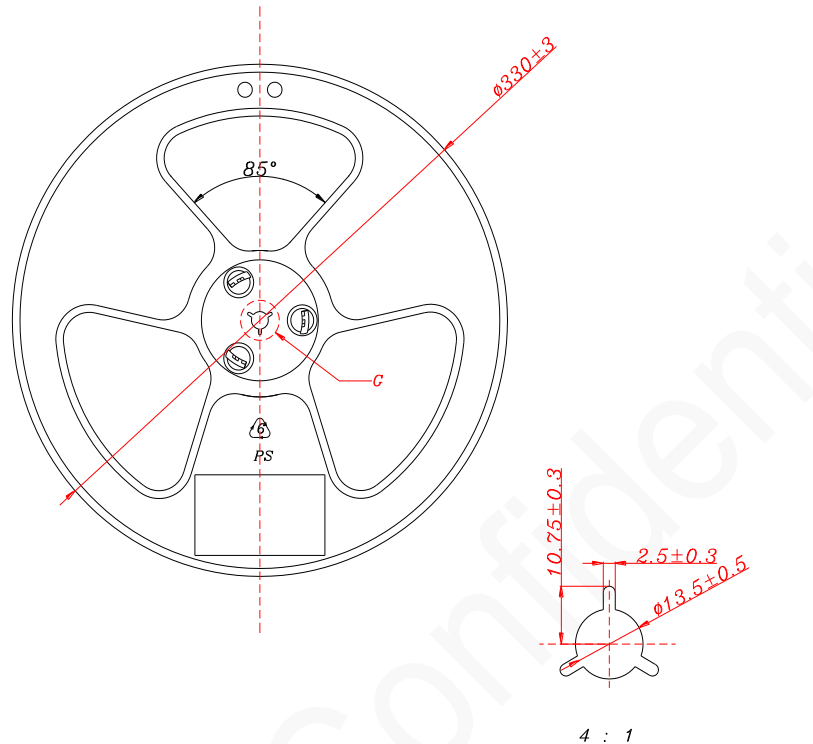


#### Tape



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>	3.3 <sup>+0.10</sup> <sub>0.10</sub>	0.0 <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>	1.5 <sup>+0.10</sup> <sub>0.00</sub>	0.0 <sup>+0.25</sup> <sub>0.00</sub>	4.0 <sup>+0.10</sup> <sub>0.10</sub>	2.0 <sup>+0.10</sup> <sub>0.10</sub>

## Reel



### 5.3.2 Humidity-Sensitive

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 tray directly.

## 5.4 Storage

N11 should be stored in the following conditions:

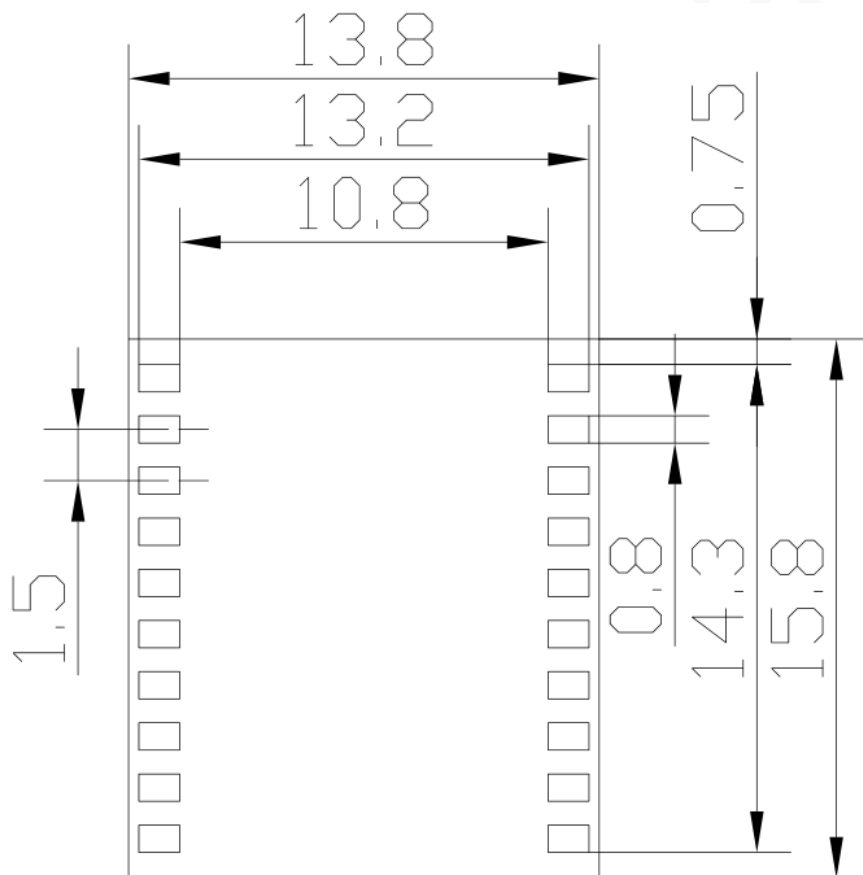
- Temperature:  $20^\circ\text{C}$  to  $26^\circ\text{C}$
- Humidity: 40% to 60%
- Period: 120 days

## 6 Mounting N11 onto Application Board

N11 is introduced in a 20-pin LGA package. This chapter describes N21 footprint, recommended PCB design and SMT information to guide users on how to mount the module onto the application PCB board.

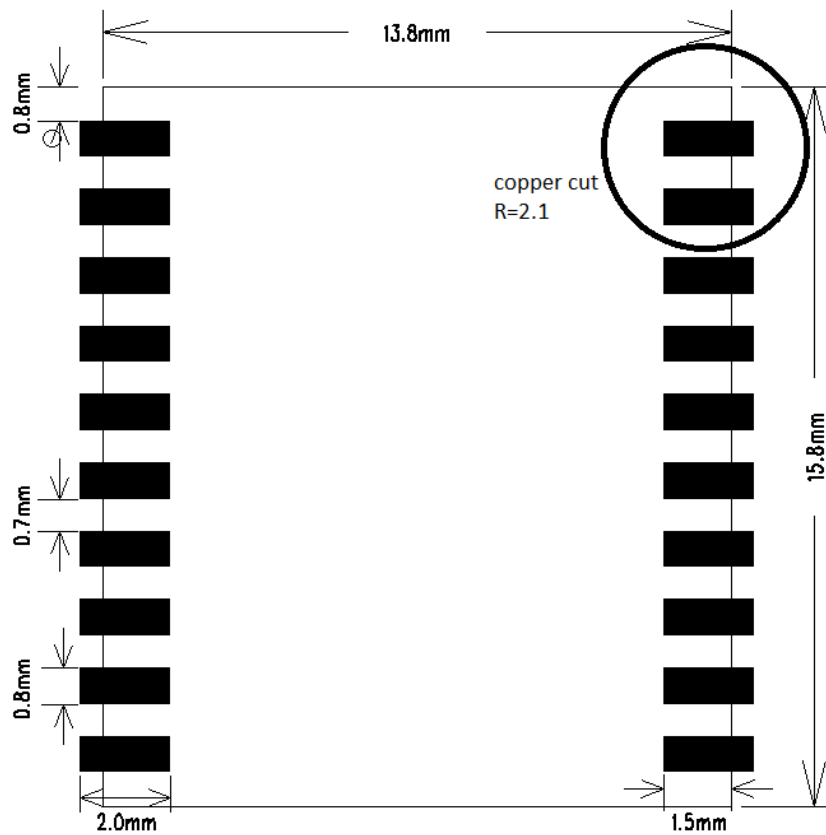
### 6.1 Bottom Dimensions

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



## 6.2 Application Footprint

Figure 6-2 Recommended PCB footprint (Unit: mm)



## 6.3 Stencil

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

## 6.4 Solder Paste

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

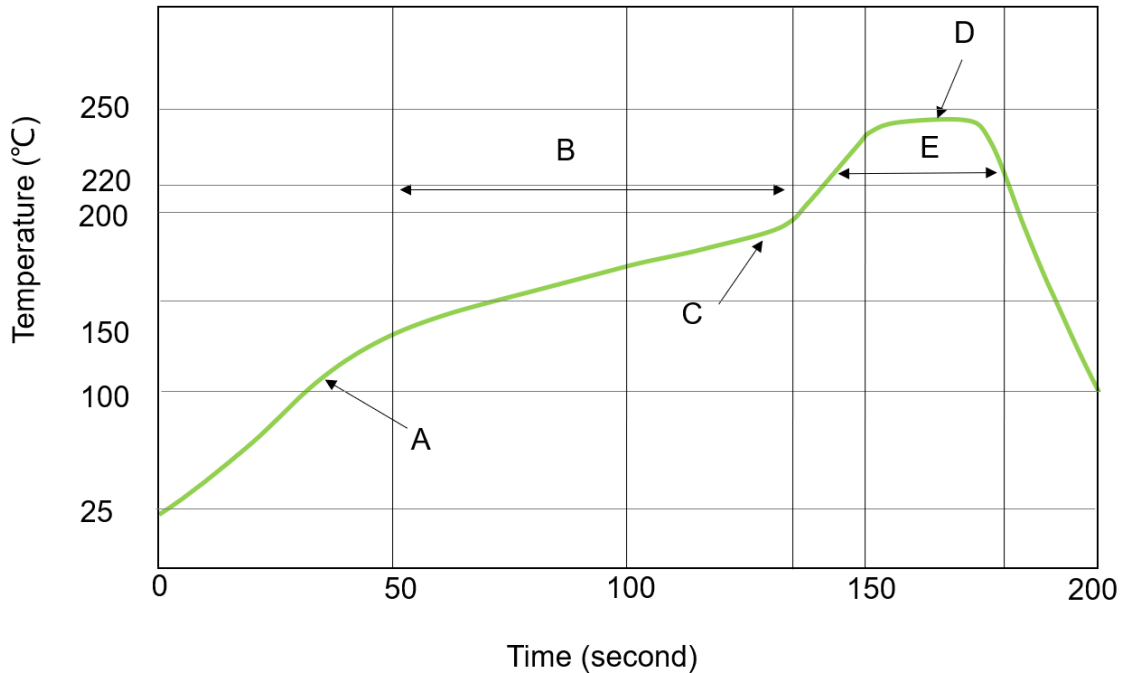
- The melting temperature of solder paste with lead is 35 °C lower than that of solder paste without lead. It is easy to cause voiding for LCC inside the module after the second reflow soldering.
- When using only solder pastes with lead, please ensure that the reflow temperature is kept at 220 °C for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



## 6.5 SMT Profile

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



Neoway will not provide a 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°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.

Neoway Confidential

## 7 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 route 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.