

# N21 Specifications

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Neoway Product Document



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## Notice

This document provides guide for users to use N21.

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

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Sales@neoway.com

Support@neoway.com

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

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# About This Document

## Scope

This document is applicable to N21 series.

It defines the features, indicators, and test standards of the N21 module.




## Audience

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

## Change History

Issue	Date	Change	Changed By
1.0	2018-04	Initial draft	Huang Jianlong
1.1	2018-04	Changed SIM_SELECT to WAKEUP.	Huang Jianlong
1.2	2018-05	Changed BT_ANT to RESERVED and WAKEUP to RESET.	Huang Jianlong
1.3	2018-05	Changed the pin definition.	Huang Jianlong
1.4	2018-09	<ul style="list-style-type: none"><li>Updated voltage range</li><li>Update temperature range</li><li>Updated variants and bands</li><li>Added compliant standards</li></ul>	Huang Jianlong

## Conventions

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

## Related Documents

*Neoway\_N21\_Datasheet*

*Neoway\_N21\_Product\_Specifications*

*Neoway\_N21\_AT\_Command\_Mannual*

*Neoway\_N21\_EVK\_User\_Guide*

# 1 About N21

## 1.1 Product Overview

N21 is an ultra-small industrial-grade NB-IoT module. It has several variants that support different bands.

Table 1-1 Variants and bands

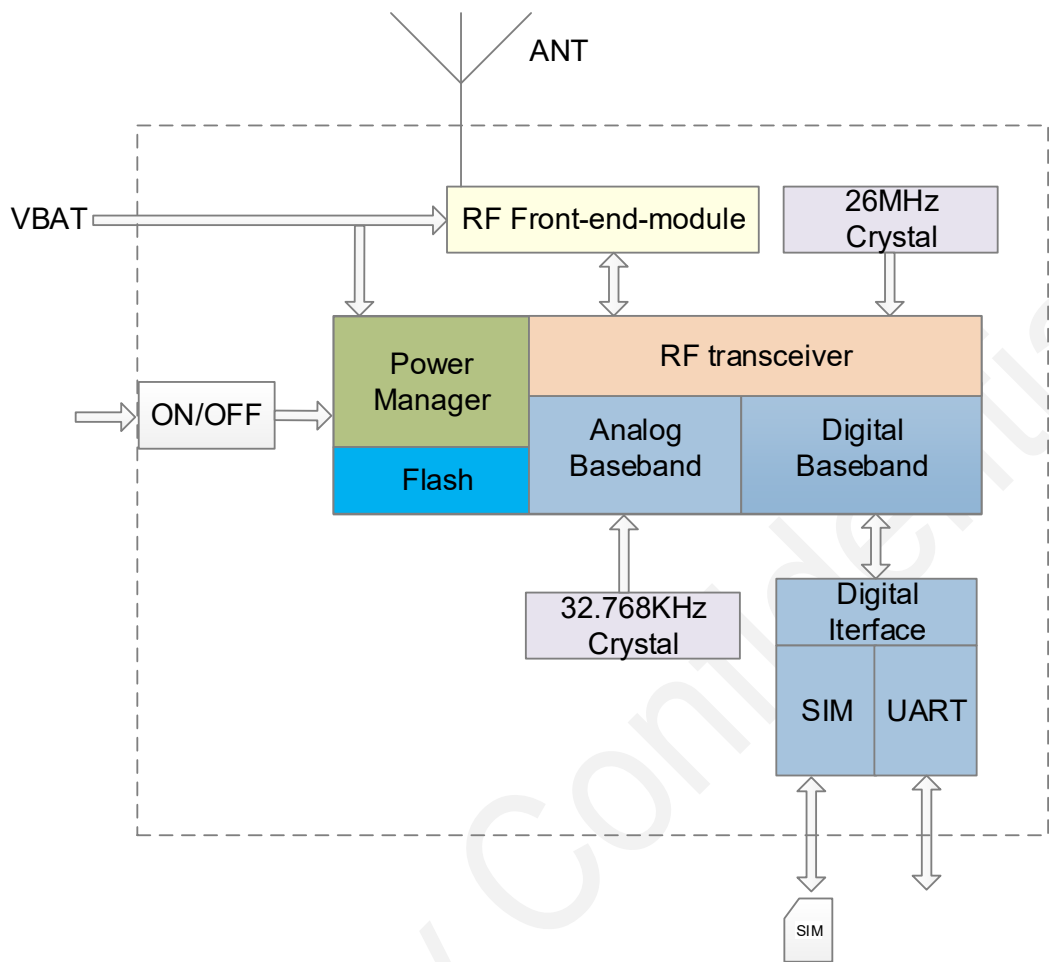
Module	Variant	Network	Band
N21	N21-CN-011AS1	Cat NB1	HD-FDD: B3,B5,B8
	N21-EU-011AS1	Cat NB1	HD-FDD: B3,B8,B20
	N21-AP-011AS1	Cat NB1	HD-FDD: B3,B5,B8,B28

Featured with ultra-low power consumption, extensive coverage and simple peripheral circuits, N21 facilitates development and is well applicable to IoT applications that requires low rate and low power consumption. It adopts LGA package and its dimensions are 18 mm x 13.8 mm x 2.5 mm, which can meet the size requirement of most customers.

## 1.2 Block Diagram

N21 provides the following functionality modules: baseband, Flash, crystal oscillator, power management, digital interfaces (USIM, UART, etc), and RF section.

Figure 1-1 Block diagram



### 1.3 Features

Table 1-2 N21 baseband and wireless features

Specifications	Description
Physical features	Dimensions (H*W*D): 18±0.15 mm x 13.8±0.15 mm x 2.5±0.15 mm
	Package: 22-Pin LGA
	Weight: 1.3g
Temperature ranges	Operating: -30 °C to +75 °C
	Extended: -40 °C to +85 °C
	Storage: -45 °C to +90 °C
Power supply	VBAT: 3.1V to 4.3V, typical: 3.6 V
Current	Idle: 3mA(@DRX =1.28s)

	eDRX: TBD (@eDRX =40.96s, PTW=10.24s)
	PSM: <4 $\mu$ A
Processor	MIPS processor Main frequency: 192MHz 16KB L2 cache
Memory	RAM: 32Mb ROM: 128Mb
Frequency band	See Table 1-1.
Rate	LTE Cat NB1: 32Kbps (DL)/72Kbps (UL)
Power grade	LTE: +23dBm+/-2dB(Power Class 3)
Antenna feature	4G antenna, 50 $\Omega$ impedance
Application interfaces	1 UART interface, used to send AT commands
	1 USIM interface, 1.8V/3V dual-voltage adaptive
	eSIM, 2*2mm eSIM (optional)
	RESET_N, triggered by low level
AT command	3GPP Rel-13 Neoway extended commands
SMS	TEXT/PDU Point to Point/Cell Broadcast
Protocol	CoAP, UDP, MQTT, TCP/IP, HTTP/HTTPS, FTP, LWM2M
Certificate approval	CCC, SRRC, CTA, RoHS, CE*, GCF*, Vodafone*, FCC*

\* indicates in development



## 2 Compliant Standards

- 3GPP TS Cat NB1 Specification Set
- 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
- CNCA-O7C-031:2007 Rules for Compulsory Certification of Telecommunication Equipment  
Telecommunication Terminal Equipment

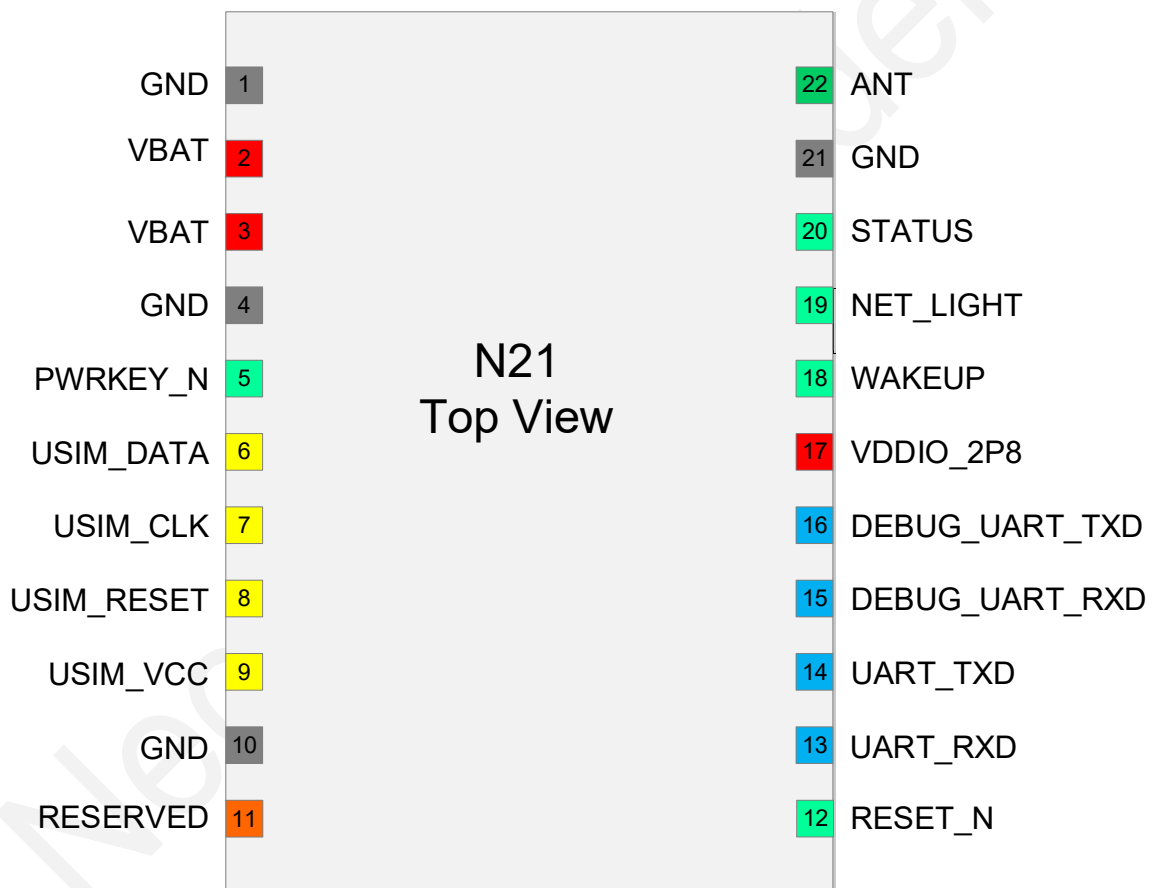
## 3 Pin and Appearance

There are 22 pins on N21 and their pads are introduced in LGA package.

### 3.1 Pad Layout

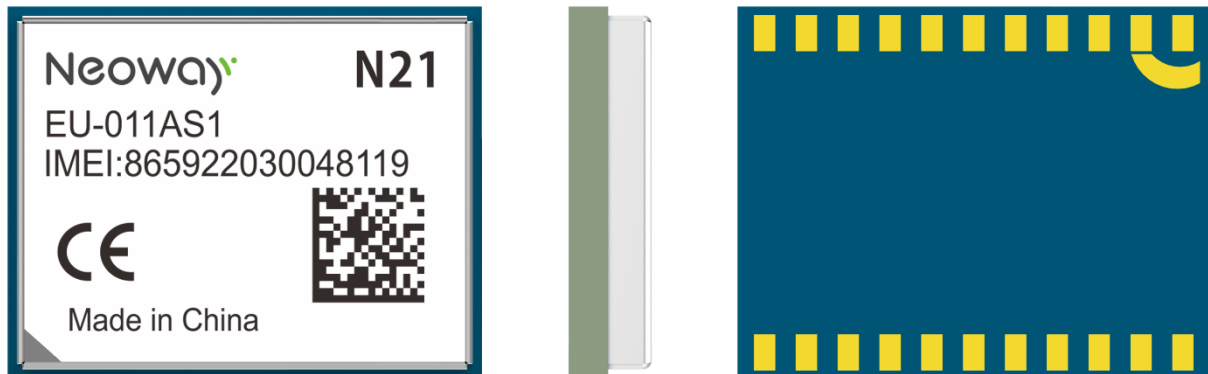
Figure 3-1 shows the pad layout of N21.

Figure 3-1 N21 pin definition (top view)



## 3.2 Appearance

Figure 3-1 N21 appearance



## 4 Electrical Feature and Reliability

### 4.1 Electric Thresholds

Table 4-1 N21 electrical features

Status		Minimum Value	Typical Value	Maximum Value
VBAT	V <sub>in</sub>	3.1V	3.6V	4.3V
	I <sub>in</sub>	/	/	500 mA



Note

- If the input voltage is lower than the minimum value, the module might fail to start. If the voltage exceeds the high threshold 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 outputs a current of at least 500 mA.

### 4.2 Current Feature

Table 4-2 N21 currents (Typical)

Band \ State	Power (dBm)	PSM (uA)	Idle (DRX/eDRX) (mA)	Active (mA)	
				TX	RX
Cat NB1: B3, B5, B8, B20, B28	23	<4.5	1.7/1	135	TBD
	0	<4.5	1.7/1	51	TBD
	-10	<4.5	1.7/1	36	TBD

## 4.3 Temperature

Table 4-3 Temperature feature

Module Status	Minimum Value	Typical Value	Maximum Value
Operating	-30°C	25 °C	75 °C
Storage	-45°C	25 °C	90 °C



Note

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 it can still work properly.

## 4.4 ESD Protection

Humidity: 45% Temperature: 25 °C

Table 4-4 N21 ESD feature

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	±4KV	±8KV
Others	±2 kV	±4 kV

## 5 RF Features

### 5.1 Operating Bands

Table 5-1 N21 operating band

Operating Band	Uplink	Downlink
HD-FDD-LTE B3	1710~1785MHz	1805~1880MHz
HD-FDD-LTE B5	824~849MHz	869~894MHz
HD-FDD-LTE B8	880~915MHz	925~960MHz
HD-FDD-LTE B20	832~862MHz	791~821MHz
HD-FDD-LTE B28	703~748MHz	758~803MHz

### 5.2 TX Power and RX Sensitivity

Table 5-2 N21 RFTX power

Band	Max Power	Min Power
HD-FDD LTE B3	23dBm+2/-2dB	<-40dBm
HD-FDD LTE B5	23dBm+2/-2dB	<-40dBm
HD-FDD LTE B8	23dBm+2/-2dB	<-40dBm
HD-FDD LTE B20	23dBm+2/-2dB	<-40dBm
HD-FDD LTE B28	23dBm+2/-2dB	<-40dBm

Table 5-3 N21 receiving sensitivity

Band	REFSENS	Duplex Mode
LTE B3, B5, B8, B20, B28	≤-113dBm	HD-FDD



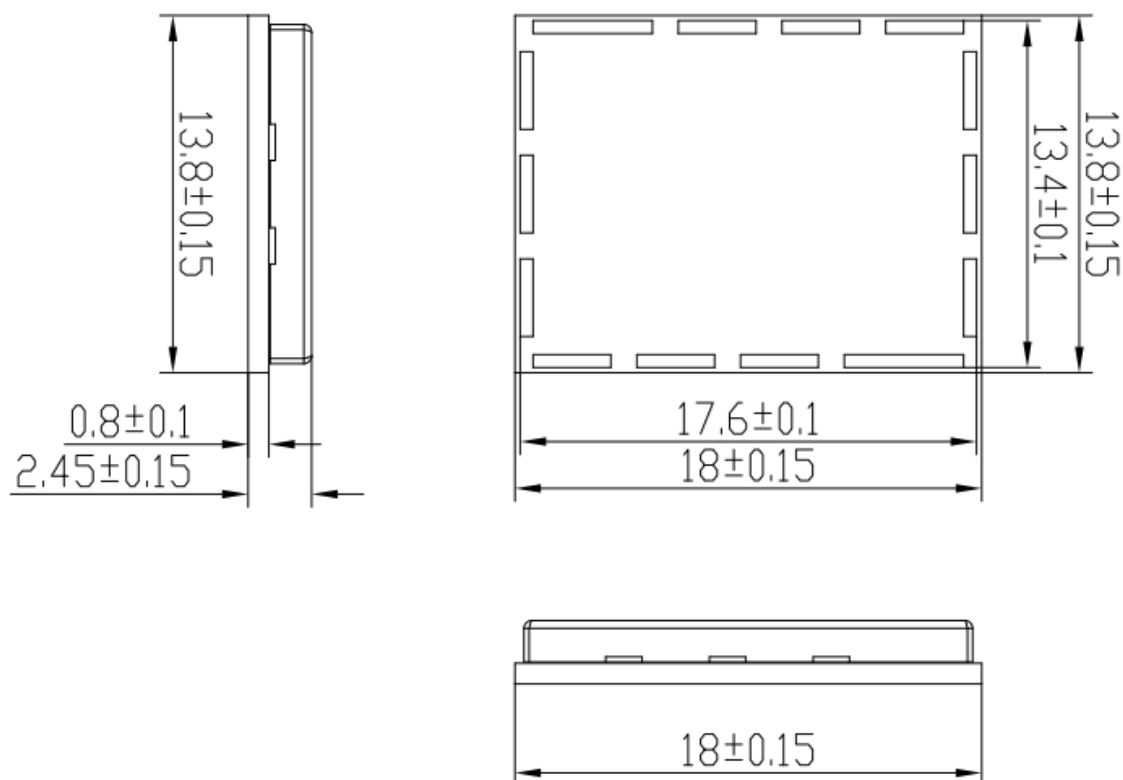
Note

The values were obtained by RF analyzers in lab.

## 6 Mechanical Features

### 6.1 Dimensions

Figure 6-1 N21 dimensions (Unit: mm)



## 6.2 Label

Figure 6-2 shows the label of N21.

Figure 6-2 N21 label



## 6.3 Packaging

### 6.3.1

N21 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.

If exposed to air for more than 48 hours at conditions not worse than 30°C/60% RH, a baking procedure should be done 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.



Figure 6-3 N21 tray



## 6.4 Storage Conditions

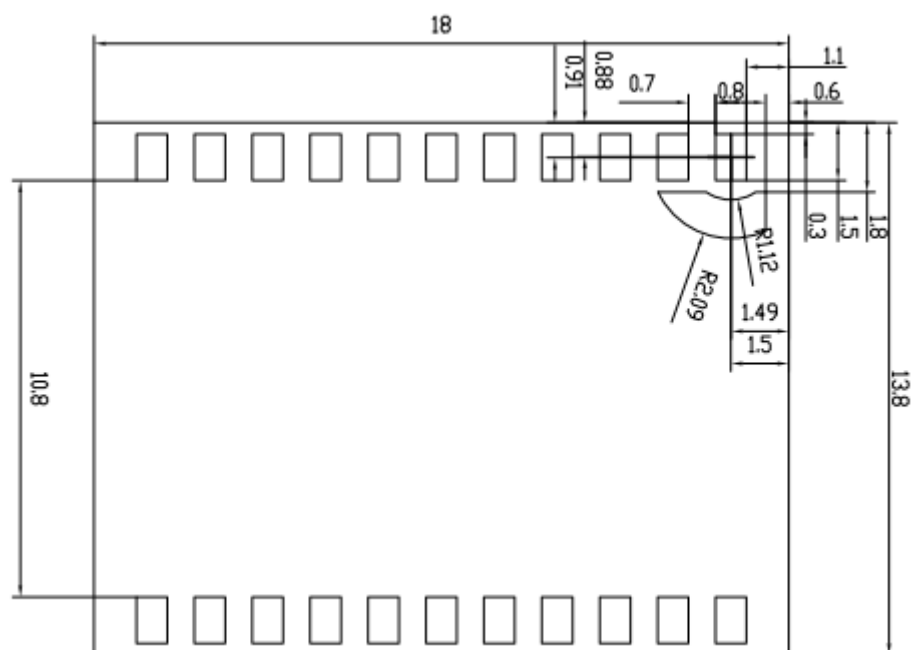
- Temperature: 20°C~ 26°C
- Humidity: 40%-60%
- Period: 120 days

## 7 Application Design and SMT

N21 is introduced in LGA package. This chapter provides N21 foot print, recommended PCB design and SMT information to guide users how to mount the module onto application PCB board.

### 7.1 N21 Foot Print

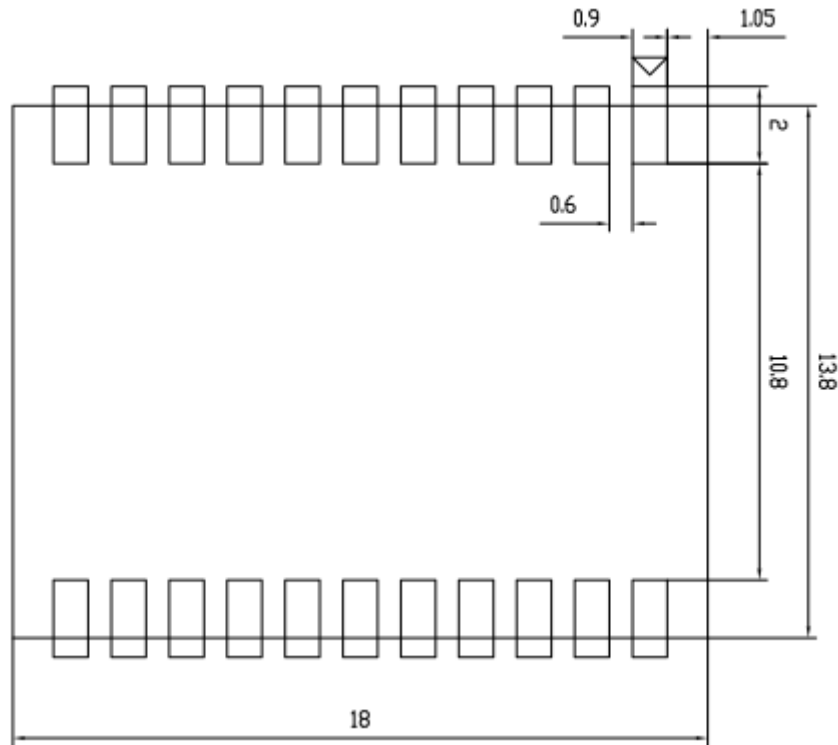
Figure 7-1 N21 foot print (bottom view)



## 7.2 Application Foot Print

Figure 7-2 shows the recommended application PCB foot print. (Unit: mm)

Figure 7-2 N21 PCB 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

Do not use a 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 faulty joints for LGA 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.

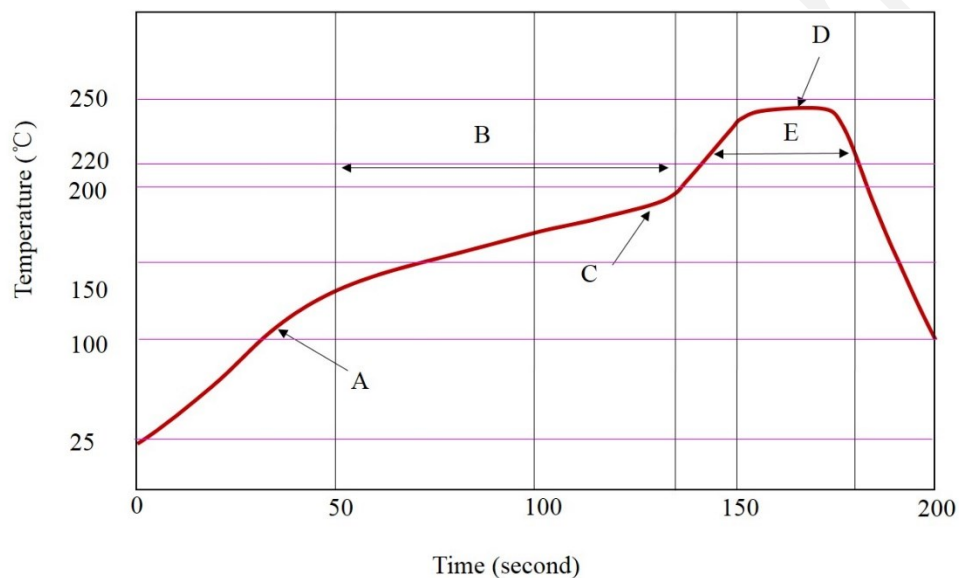
## 7.5 Reflow Profile

N21 is compatible with industrial standard reflow profile for lead-free SMT process.

The reflow profile is process dependent, so the following recommendation is just a start point guideline:

- Only one flow is supported.
- Quality of the solder joint depends on the solder paste volume. Minimum of 0.12 mm to 0.15 stencil thickness is recommended.
- Use bigger aperture size of the stencil than actual pad size.
- Use a low-residue, no-clean type solder paste.

Figure 7-3 Temperature curve



X: Time (s) Y: Temperature (°C)

Technical parameters:

- Ramp up rate: 1 to 4 °C/sec
- Ramp down rate: -3 to -1 °C/sec
- Soaking zone: 150-180 °C for 60-100 seconds
- Reflow zone: >220 °C for 40-90 seconds
- Peak temperature: 235-250°C



Warning

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

For information about cautions in N21 storage and mounting, refer to *Neoway Module Reflow*

*Manufacturing Recommendations.*

To maintain and manually desolder it, use heat guns with great opening, adjust the temperature to 250 degrees (depending on the type of the solder paste), and heat the module till the solder paste is melt. Use tweezers to remove the module. Do not shake the module in high temperature while removing it. Otherwise, the components inside the module might be misplaced.

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## 8 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 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.