

N20 Specifications

Version 1.0



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Notice

This document provides guide for users to use the N20.

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

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1 Introduction to N20

1.1 Overview

N20 is an industrial-grade module developed on Qualcomm platform. Its dimensions are 23.8 mm x 25.8 mm x 2.8 mm. This module has an ultra-wide operating temperature range of -40 °C to +85 °C and electrostatic capacity of 8 kV. N20 is well applicable to develop low-rate low-power consumption IoT terminals with the following features:

- ARM Cortex-A7 processors, 1.3 GHz main frequency, 256 KB L2 cache, 28 nm process technology
- Cat M1/Cat NB1/GSM/GNSS
- USB2.0/UART/ADC/SPI/I2C/PCM/SDIO/GPIO

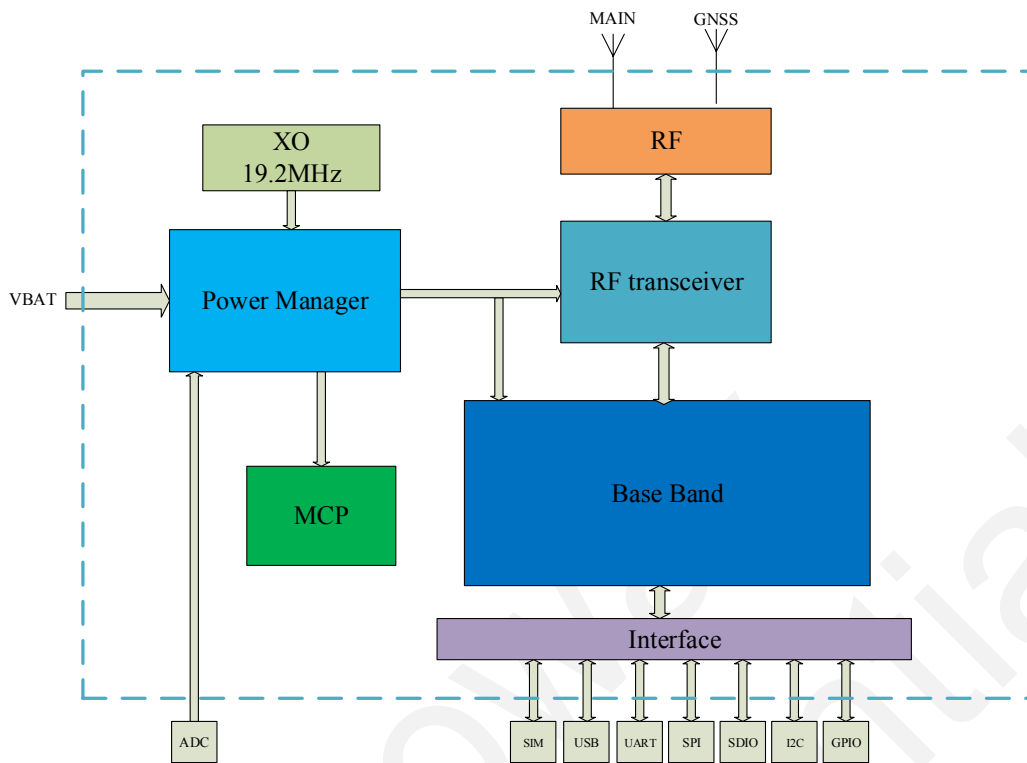
N20 series include the following variants to meet the band requirements in different regions:

Module	Version	Network Mode	Band	GNSS
N20	N20-US-011AS1	Cat M1	HD-FDD: B2,B4,B12, B13(Cat M1)	Support
	N20-CN-011AS1	Cat M1/Cat NB1/GSM	HD-FDD: B1,B3,B5,B8(Cat M1/Cat NB1) TDD: B39 (Cat M1) GSM/GPRS/EDGE:900/1800 MHz	Support
	N20-CA-011AS1	Cat M1/Cat NB1	HD-FDD: B3,B5,B8 (Cat M1/Cat NB1)	Support
	N20-CB-011AS1	Cat NB1	HD-FDD: B3,B5,B8 (Cat NB1)	Support
	N20-EU-011AS1	Cat M1/Cat NB1/GSM	HD-FDD: B3,B8,B20 (Cat M1/Cat NB1) GSM/GPRS/EDGE:900/1800 MHz	Support
	N20-JP-011AS1	Cat M1/Cat NB1	HD-FDD: B1, B3, B8, B18, B19, B26 (Cat M1/Cat NB1)	Support
	N20-AP-011AS1	Cat M1/Cat NB1/GSM	HD-FDD: B3,B28(Cat M1/Cat NB1) GSM/GPRS/EDGE:900/1800 MHz	Support

1.2 Block Diagram

Figure 1-1 shows the block diagram of N20.

Figure 1-1 N20 block diagram



1.3 Features

Table 1-1 N20 baseband and wireless features

Specifications	Description
Power supply	VBAT: 3.3V to 4.3 V; Typical value: 3.8 V
Current in sleep mode	TBD
Current in PSM mode	TBD
Operating temperature	-40 °C to +85 °C
Processor	ARM Cortex-A7 processor Main frequency: 1.3 GHz 256 kB L2 cache
Memory	ROM: 1 Gb RAM: 512 MB Or ROM: 2 Gb RAM: 1 Gb
Rate	GPRS: Max 85.6 Kbps(DL) / Max 85.6 Kbps(U)

	EDGE: Max 236.8 Kbps(DL)/Max 236.8 Kbps(UL) LTE Cat M1: 375 Kbps(DL)/300 Kbps(UL) LTE Cat NB1: 32 Kbps(DL)/72 Kbps(UL)
Transmit power	EGSM900: +33 dBm (Power Class 4) DCS1800: +30 dBm (Power Class 1) EDGE 900 MHz: +27 dBm (Power Class E2) EDGE 1800 MHz: +26 dBm (Power Class E2) LTE: +23 dBm (Power Class 3)
Antenna feature	2G/4G antenna, GNSS antenna, 50 Ω impedance
UART	At most 4 Mbps, 2 UART interfaces
UIM	1 UIM interface, 1.8V/3V dual-voltage adaptive
USB	1 high-speed USB2.0 interface
ADC	2 16-bit ADC interfaces, input voltage ranging from 0.1 V to 1.7 V
SPI	1 SPI interface, supporting only host mode At most 50 Mbps
I2C	1 I2C interface, used to control external sensor
PCM	1 PCM interface, used to transmit digital audio
SDIO	1 SDIO interface, used to control 4-bit WLAN interface
GPIO	4 GPIOs

2 Dimensions and Pin Definition

N20 adopts 68-pin LCC encapsulation package.

Table 2-1 N20 dimensions

Specifications	N20
Dimensions	23.8±0.15 mm x 25.8±0.15 mm x 2.8±0.15 mm (H x W x D)
Weight	TBD
Package	68-pin LCC

Figure 2-2 N20 module pin definition (Top View)

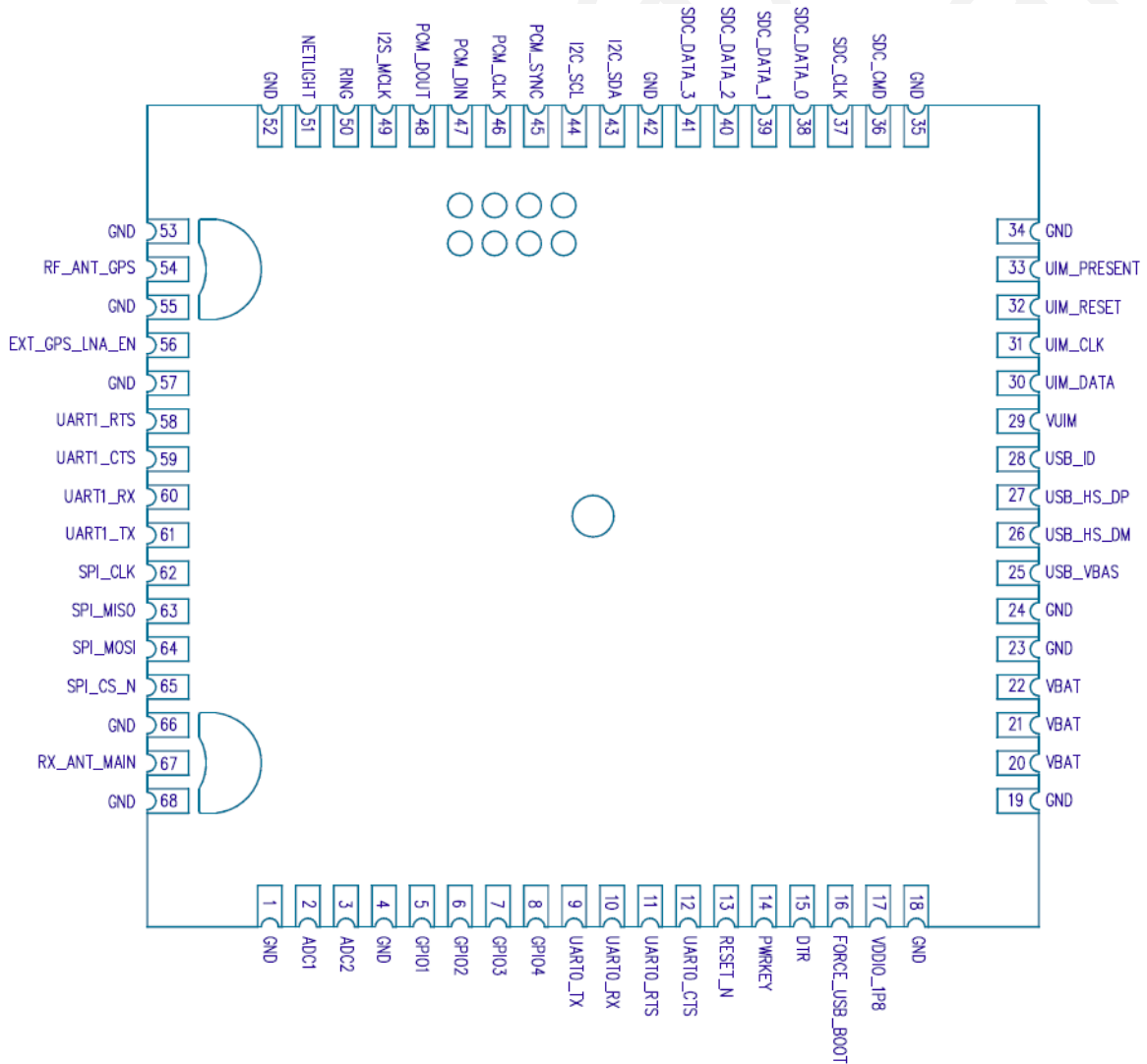
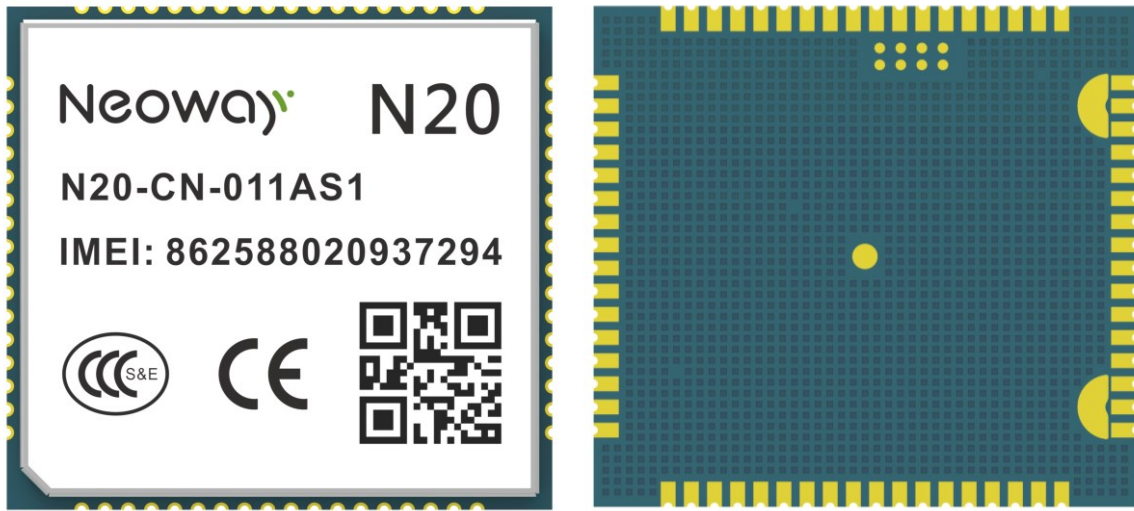


Figure 2-3 N20 appearance



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3 Electrical Features and Reliability

3.1 Electrical Features

Table 3-1 N20 electric features

Module Status		Minimum Value	Typical Value	Maximum Value
VBAT	V _{in}	3.3 V	3.8 V	4.3 V
	I _{in}	/	/	2 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 outputs at least 2 A current.

3.2 Temperature

Table 3-2 Temperature feature

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



CAUTION

If the module works in temperature exceeding the thresholds, some of its RF performance indicator might be worse but it can still work properly.

3.3 ESD

Electronic products need to pass several 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 3-3 N20 ESD 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

4 RF Features

4.1 Working Band

Table 4-1 N20 working band

Work band	Uplink	Downlink
EGSM900	880~915 MHz	925~960 MHz
DCS1800	1710~1785 MHz	1805~1880 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 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 B39	1880~1920 MHz	1880~1920 MHz

4.2 TX Power and RX Sensitivity

Table 4-2 N20 RF TX power

Band	Max Power	Min. Power
EGSM900	33dBm+2/-2dB	5dBm+2/-2dB
DCS1800	30dBm+2/-2dB	0dBm+2/-2dB
HD-FDD LTE B1	23dBm+2/-2dB	<-40dBm
HD-FDD LTE B2	23dBm+2/-2dB	<-40dBm

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 B12	23dBm+2/-2dB	<-40dBm
HD-FDD LTE B13	23dBm+2/-2dB	<-40dBm
HD-FDD LTE B17	23dBm+2/-2dB	<-40dBm
HD-FDD LTE B18	23dBm+2/-2dB	<-40dBm
HD-FDD LTE B19	23dBm+2/-2dB	<-40dBm
HD-FDD LTE B20	23dBm+2/-2dB	<-40dBm
HD-FDD LTE B26	23dBm+2/-2dB	<-40dBm
HD-FDD LTE B28	23dBm+2/-2dB	<-40dBm
TDD-LTE B39	23dBm+2/-2dB	<-40dBm

Table 4-3 N20 GSM RX sensitivity

Band	REFSENS	
EGSM900	<=-108dBm	
DCS1800	<=-108dBm	

Table 4-4 N20 Cat M1 QPSK RX sensitivity

Band	REFSENS	Duplex Mode
LTE B1	<=-103dBm	HD-FDD
LTE B2	<=-101dBm	HD-FDD
LTE B3	<=-100dBm	HD-FDD
LTE B4	<=-103dBm	HD-FDD
LTE B5	<=-101dBm	HD-FDD
LTE B8	<=-100dBm	HD-FDD
LTE B12	<=-100dBm	HD-FDD
LTE B13	<=-100dBm	HD-FDD
LTE B18	<=-103dBm	HD-FDD
LTE B19	<=-103dBm	HD-FDD
LTE B20	<=-100dBm	HD-FDD
LTE B26	<=-100dBm	HD-FDD

LTE B28	$\leq -101\text{dBm}$	HD-FDD
LTE B39	$\leq -100\text{dBm}$	TDD

 NOTE

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

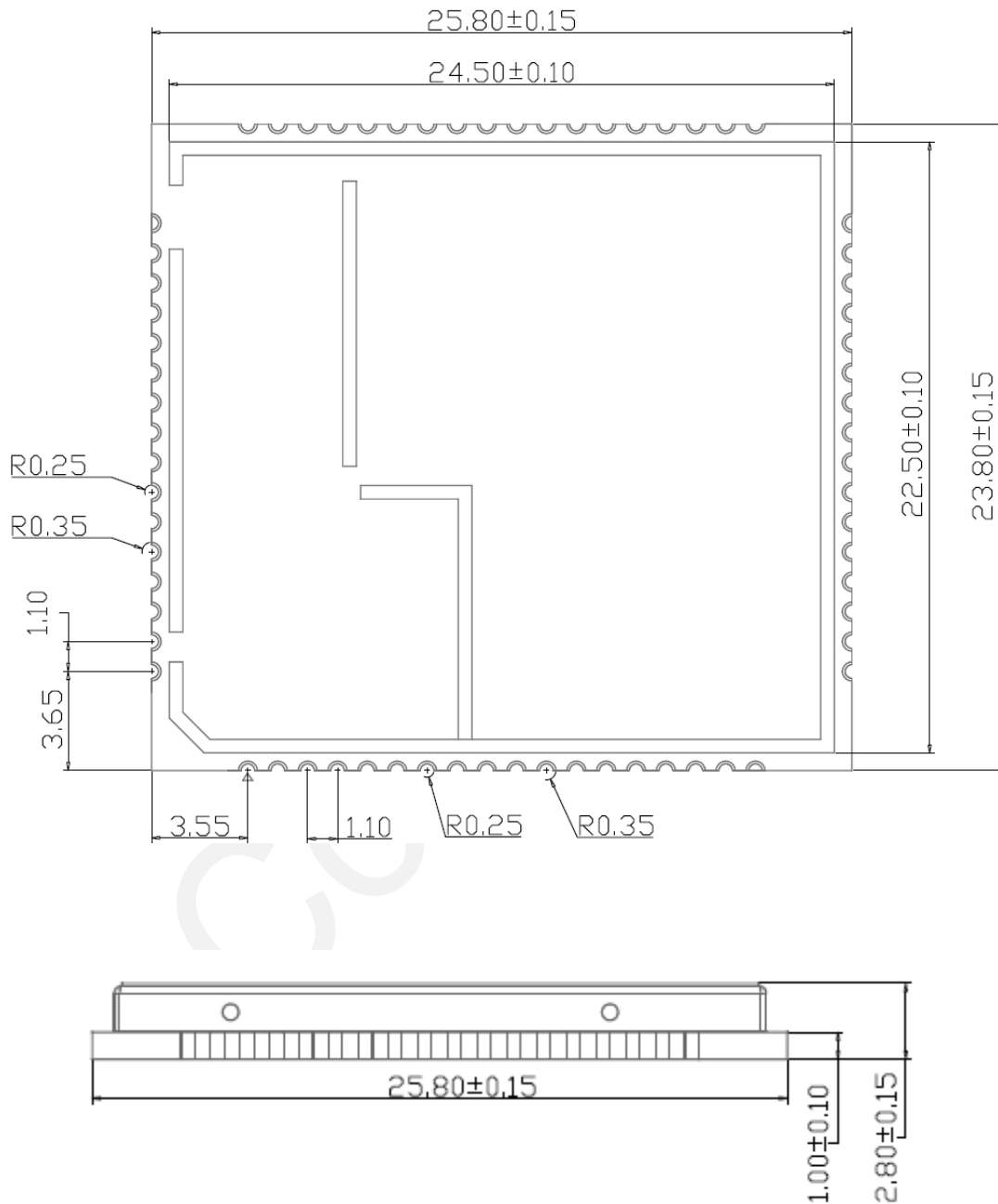
Table 4-5 N20 Cat NB1 RX sensitivity

Band	REFSENS	Duplex Mode
LTE B1,B2,B3,B5,B8,B18,B19,B20,B26,B28	$\leq -107.5\text{dBm}$	HD-FDD

5 Mechanical Features

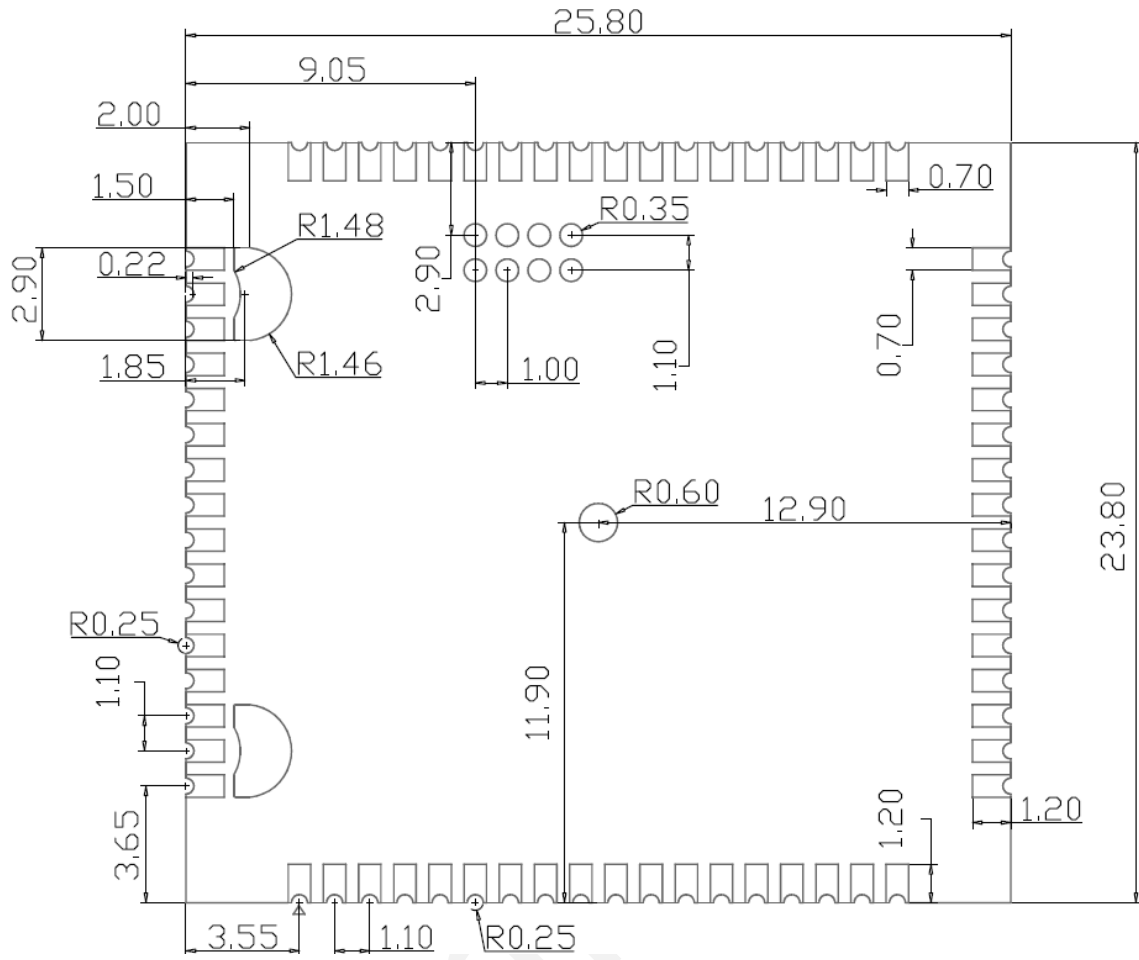
5.1 Dimensions

Figure 5-1 Dimensions of N20



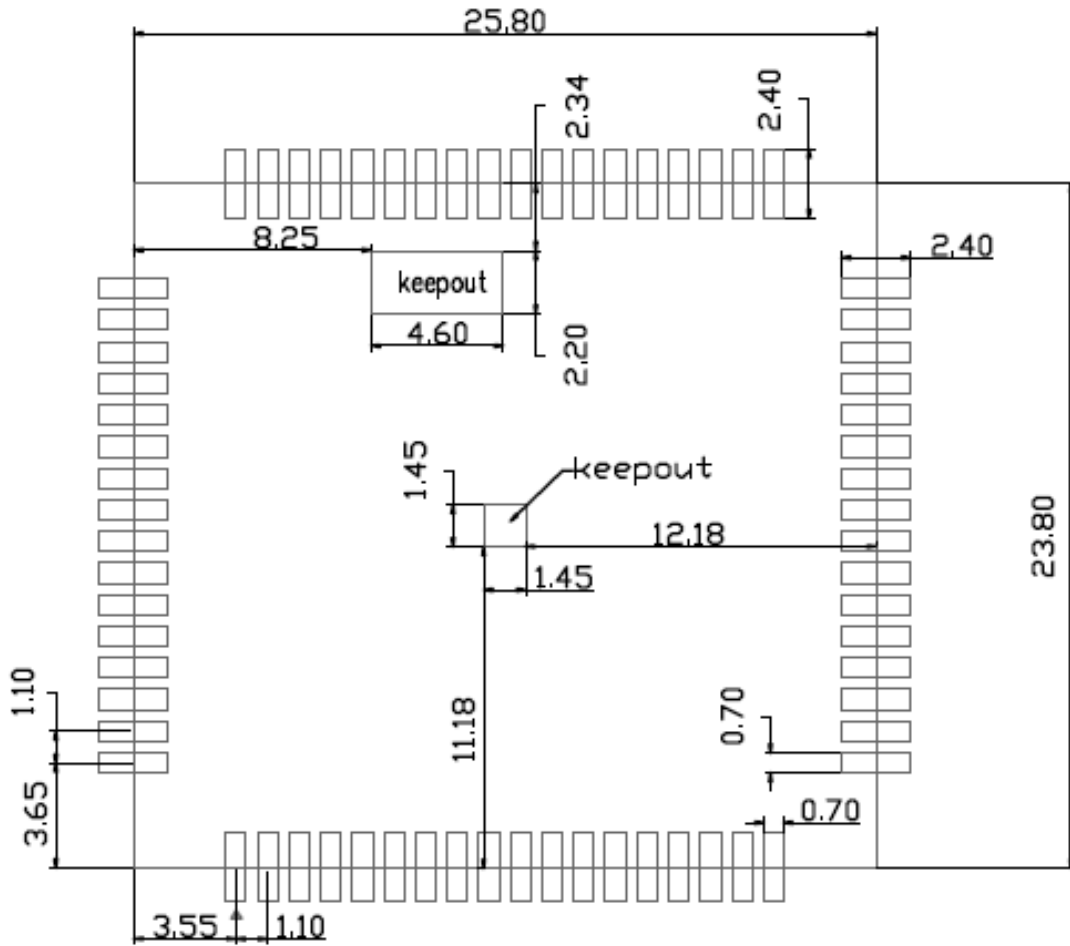
5.2 PCB Foot Print

Figure 5-2 N20 PCB foot print (Top View)



5.3 Recommended PCB Foot Print

Figure 5-3 Recommended N20 PCB foot print (unit: mm)



6 Mounting and Packaging

6.1 Mounting the Module onto the Application Board

N20 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 volume. Minimum of 0.12 mm to 0.15mm stencil thickness is recommended.
- Use bigger aperture size of the stencil than actual pad size.
- Use a low-residue, no-clean type solder paste.

For information about cautions in N20 storage and mounting, refer to *Neoway Module Reflow Manufacturing Recommendations*.

When maintaining and manually desoldering 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. Then remove the module using tweezers. Do not shake the module in high temperature when removing it. Otherwise, the components inside the module might get misplaced.

6.2 Packaging

N20 modules are packaged in sealed bags on delivery to guarantee a long shelf life. Package the modules again in case of opening 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.



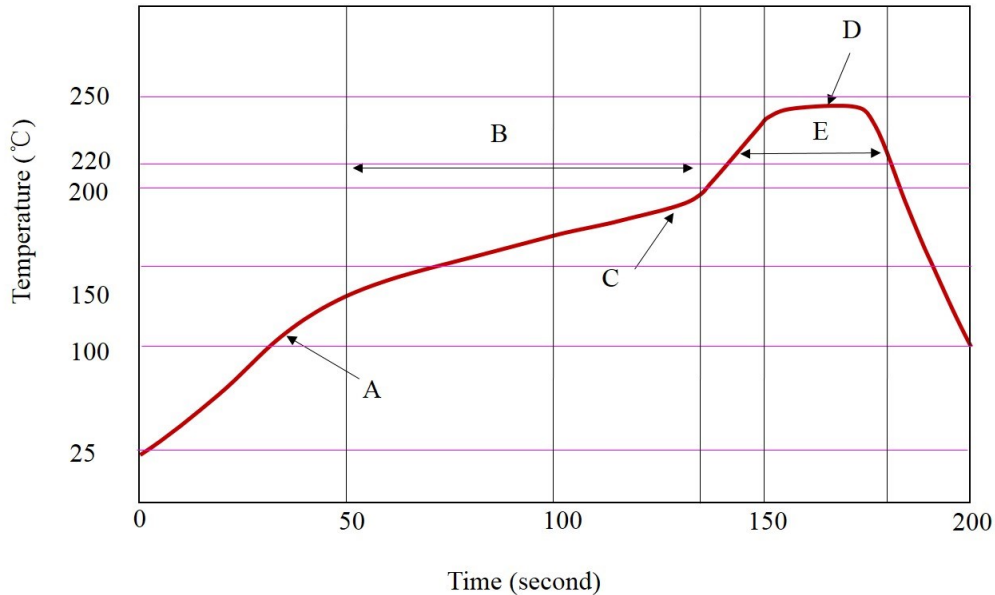
6.3 Storage Conditions

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

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7 SMT Temperature Curve

Figure 7-1 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, Time: 60-100 s
- Reflow zone: >220 °C, Time: 40-90 s
- Peak temperature: 235-250 °C

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 faulty joints for 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.



WARNING

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

8 Abbreviations

ADC	Analog-Digital Converter
DTR	Data Terminal Ready
EGSM	Enhanced GSM
ESD	Electronic Static Discharge
FDD	Frequency Division Duplex
GNSS	Global Navigation Satellite System
GPRS	General Packet Radio Service
GPIO	General-Purpose Input/Output
GPS	Global Positioning System
GSM	Global Standard for Mobile Communications
I2C	Inter integrated Circuit
LDO	Low Dropout Regulator
LNA	Low Noise Amplifier
LTE	Long-Term Evolution
Mbps	Million bits per second
MCU	Micro Controller Unit
PCB	Printed Circuit Board
PCM	Pulse-Coded Modulation
SDC	Secure Digital Controller
SDR	Single Data Rate
SIM	Subscriber Identification Module
SPI	Serial Peripheral Interface
TBD	To Be Determined
TDD	Time Division Duplex
TVS	Transient Voltage Suppressor
UART	Universal Asynchronous Receiver-Transmitter
UIM	User Identity Module