

N706-CB

Product Specifications

LTE Cat.1
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Notice

This document provides guide for users to use N706-CB.

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 N706-CB.




Audience

This document is intended for [system engineers \(SEs\)](#), [development engineers](#), and [test engineers](#).

Change History

Issue	Date	Change	Changed By
1.0	2022-09	Initial draft	Dong Jinwen
1.1	2022-12	<ul style="list-style-type: none">Modified the N706-CB pad layout figureAdded the power consumption parametersAdded the ESD parameters	Dong Jinwen

Conventions

Symbol	Indication
	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_N706-CB_Product_Specifications

1 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, and so on.

If the product is used in a place with flammable gas or dust such as propane gas, gasoline, or flammable spray, the product will cause an explosion or fire.

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

If the product is used in medical institutions or on airplanes, electromagnetic waves emitted by this product may interfere with surrounding equipment.

Follow the requirements below in design and use of the application for this module:

- Do not disassemble the module without permission from Neoway. Otherwise, we are entitled to refuse to provide further warranty.
- Design your application correctly by referring to the HW design guide document and our review feedback on your PCB design. Connect the product to a stable power supply and lay out traces following fire safety standards.
- Please avoid touching the pins of the module directly in case of damages caused by ESD.
- Do not insert/remove a SIM card or memory card into/from the module while it is not powered off.

2 About N706-CB

N706-CB is an LTE industrial-grade cellular module developed based on Unisoc UIS8850, providing connectivity on FDD-LTE and TDD-LTE networks. The module supports rich hardware interfaces including audio, video, Wi-Fi scanning and optional GNSS function, with dimensions of (17.7 ± 0.10) mm \times (15.8 ± 0.10) mm \times (2.3 ± 0.15) mm. It is suitable for developing IoT communication devices such as wireless meter reading terminals, handheld POS, industrial routers and so on.

N706-CB has the following features:

- ARM Cortex-A5 processor, 500 MHz CPU clock speed, 32 KB I-cache and 32 KB D-cache.
- Supported network mode: LTE Cat.1
- Supported interfaces: PCM, USIM, UART, I2C, USB2.0, SPI, ADC, and so on.

2.1 Product Overview

Table 2-1 lists the models and frequency bands that N706-CB supports.

Table 2-1 Models and frequency bands

Model	Region	Frequency band	GNSS ¹	Memory
N706-CB-01	Chinese mainland	FDD-LTE: B1, B3, B5, B8 TDD-LTE: B34, B39, B40, B41	Supported	RAM: 128 Mb ROM: 64 Mb
N706-CB-02	Chinese mainland	FDD-LTE: B1, B3, B5, B8 TDD-LTE: B34, B39, B40, B41	Not supported	RAM: 64 Mb ROM: 32 Mb

2.2 Block Diagram

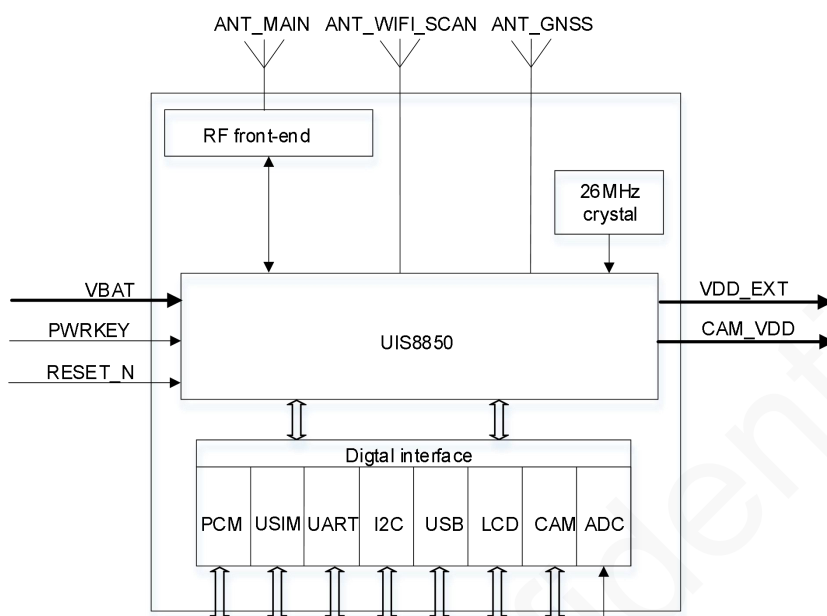
N706-CB include the following functional units:

- Baseband
- Digital interface (PCM, USIM, UART, I2C, USB 2.0, SPI)

GNSS¹ optional configuration.

- Analog interface (ADC)

Figure 2-2 Block diagram



2.3 Basic Features

Parameter	Description
Physical features	<ul style="list-style-type: none"> • Dimensions: (17.7±0.10) mm × (15.8±0.10) mm × (2.3±0.15) mm • Package: LCC+LGA (109 pins) • Weight: TBD
Temperature ranges	Operating: -30°C to +75°C Extended*: -40°C* to +85°C* Storage: -40°C to +90°C
Operating voltage	VBAT: 3.4 V to 4.2 V, typical value: 3.8 V
Operating current	Sleep mode ² : <40 uA Idle mode ³ : <15 mA

² means the current drawn by the module in sleep mode, a low power consumption state, in which its RF function is functioning properly but its peripheral interfaces are disabled. If there is an incoming call or SMS, the module will exit from the sleep mode, and after the incoming call or voice instant messaging has ended, the module will re-enter the sleep mode.

³ means the current drawn by the module in a normal operating mode, but no data service is being processed.

	Operating mode ⁴ : <650 mA
Embedded processor	ARM Cortex- A5 processor, main frequency 500 MHz.
Frequency band	FDD-LTE: B1, B3, B5, B8 TDD-LTE: B34, B39, B40, B41
Wireless rate	FDD-LTE: Cat.1, Max 10 Mbps (DL)/Max 5 Mbps (UL) TDD-LTE: Cat.1, Max 8 Mbps (DL)/Max 2 Mbps (UL)
Application Interfaces	4G antenna, GNSS antenna, WLAN antenna. The characteristic impedance of each antenna is 50 Ω.
	Three UART interfaces with baud rates up to 115200 bps. Auto-bauding is enabled by default. MAIN_UART for AT communications. AUX_UART for CP-side log capturing. DBG_UART for AP-side log capturing.
	Two USIM interfaces, supporting 1.8 V/3 V USIM cards.
	One USB2.0 interface, slave mode only
	Three SPI interfaces One flash SPI; one LCD-dedicated SPI interface; one camera-dedicated SPI interface.
	Two 12-bit ADC interfaces, voltage detection range: 0.1 V - VBAT.
	Two I2C interfaces, master mode only.
	One PCM interface
SD card AT bus command	3GPP Release 13 Neoway extended AT commands
SMS	PDU, TXT
Data	PPP, RNDIS, ECM
Protocol	TCP, UDP, MQTT, FTP, HTTP/HTTPS, SSL, TLS
Certification approval	CCC*, SRRC*, RoHS*, CE*, CTA*

* means under development

⁴: means the current drawn by the module when there is data communication.

3 Reference Standard

N706-CB is designed by referring to the following standards:

- 3GPP TS 36.521-1 V13.0.0 User Equipment (UE) conformance specification; Radio transmission and reception; Part 1: Conformance Testing
- 3GPP TS 21.111 V13.0.0 USIM and IC card requirements
- 3GPP TS 51.011 V4.15.0 Specification of the Subscriber Identity Module -Mobile Equipment (SIM-ME) interface
- 3GPP TS 31.102 V13.0.0 Characteristics of the Universal Subscriber Identity Module (USIM) application
- 3GPP TS 31.111 V13.0.0 Universal Subscriber Identity Module (USIM) Application Toolkit (USAT)
- 3GPP TS 27.007 V13.0.0 AT command set for User Equipment (UE)
- 3GPP TS 27.005 V13.0.0 Use of Data Terminal Equipment – Data Circuit terminating Equipment (DTE - DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)

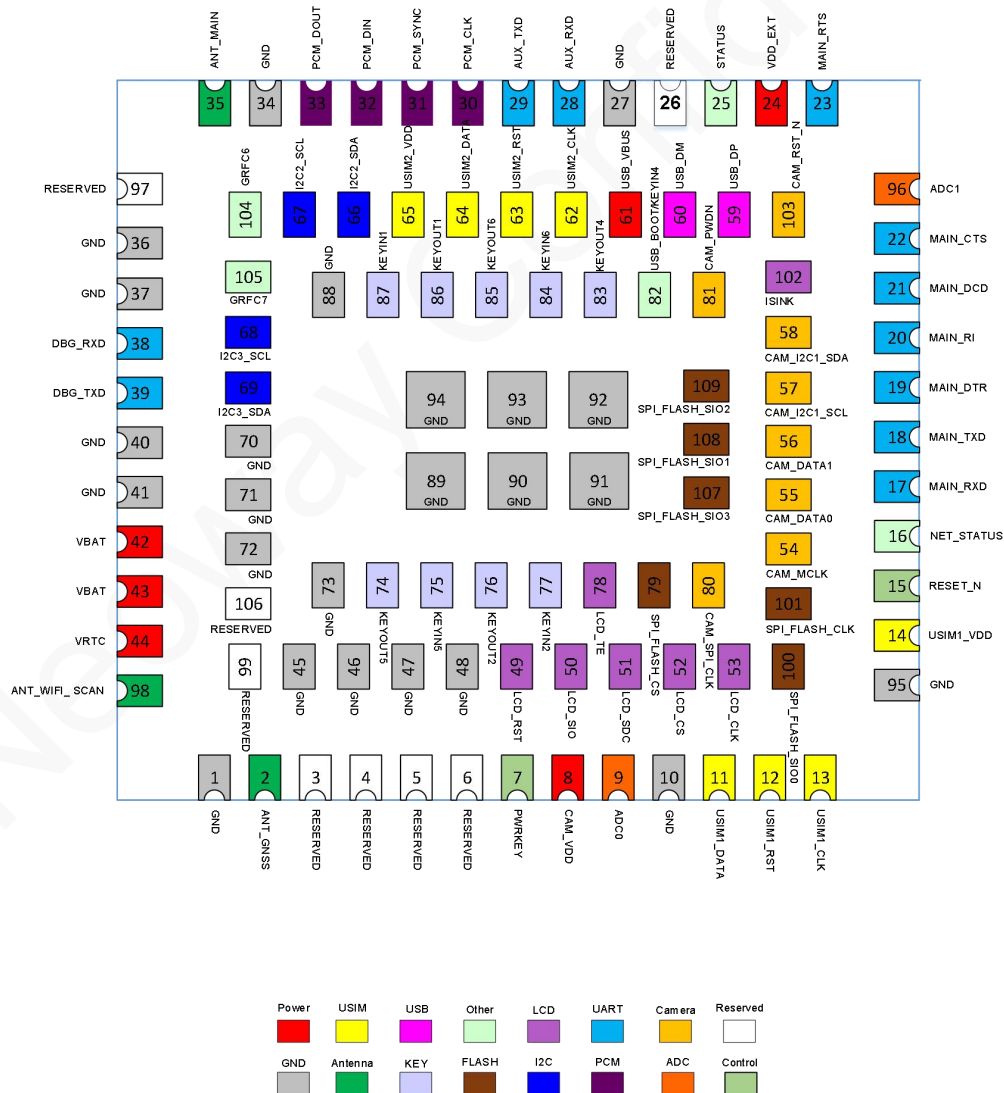
4 Pin Definitions

N706-CB modules are equipped with 109 pads, which are introduced in LCC+ LGA package.

4.1 Pad Layout

The following figure shows the pad layout of N706-CB.

Figure 4-1 N706-CB Pad layout (top view)

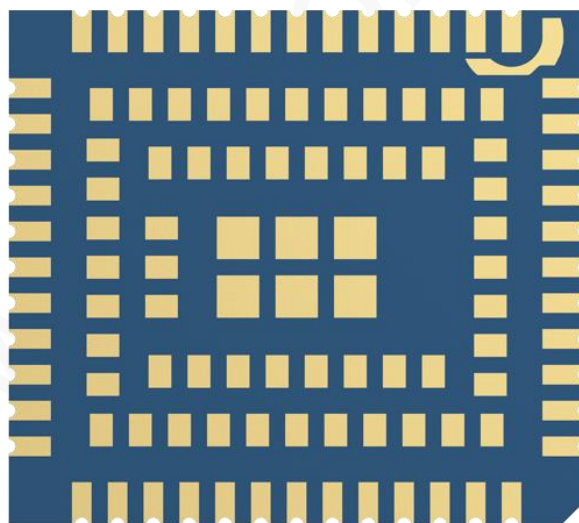


4.2 Module Appearance

Figure 4-2 Top view of N706-CB



Figure 4-3 Bottom view of N706-CB



5 Electrical Characteristics and Reliability

This chapter describes the electrical characteristics and reliability of the N706-CB module, including the input and output voltage and current of the power supply, current consumption of the module in different states, operating and storage temperature range, and ESD protection characteristics.

5.1 Electrical Characteristics



If the voltage is lower than the threshold, the module might fail to start. If the voltage is higher than threshold or there is a voltage burst during the startup, the module might be damaged permanently.

Table 5-1 N706-CB operating conditions

Parameter		Minimum value	Typical value	Max. value	Unit
VBAT	V _{in}	3.4	3.8	4.2	V
	I _{in}	N/A	N/A	TBD	A

Table 5-2 Current consumption of N706-CB (Typical)

Frequency band \ States	Sleep (mA)	Idle (mA)	Active (mA)	Unit
FDD-LTE: B1, B3, B5, B8	TBD	150	570	mA
TDD-LTE: B34, B39, B40, B41	TBD	97	320	mA

5.2 Temperature Characteristics

Parameter	Minimum value	Typical value	Max. value	Unit
Operating	-30	25	75	°C
Extended*	-40*	25	85*	°C
Storage	-40	25	90	°C



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 and cannot meet the requirements of 3GPP specification, but it will not have a great impact on the normal use of the module. After the temperature is restored, the RF performance can be restored to meet the 3GPP specification.

5.3 ESD Protection Characteristics

As electronic products need to undergo strict ESD testing, the following items are the electrostatic protection capabilities of the main pins of the module. When designing related products, you need to add corresponding ESD protection according to the industry where the product is used to ensure product quality.

Test environment: humidity 45%; temperature 25 °C

Table 5-3 ESD protection characteristics

Test point	Contact discharge	Air discharge	Unit
GND	8	15	kV
ANT	4	4	kV
Cover	8	15	kV

6 RF Characteristics

The module provides connectivity on FDD-LTE (Cat 1) and TDD-LTE (Cat 1) networks. This chapter details the wireless RF characteristics.

6.1 Operating Frequency Bands

Table 6-1 N706-CB operating bands

Operating band	Uplink	Downlink	Unit
FDD-LTE B1	1920 - 1980	2110 - 2170	MHz
FDD-LTE B3	1710 - 1785	1805 - 1880	MHz
FDD-LTE B5	824 - 849	869 - 894	MHz
FDD-LTE B8	880 - 915	925 - 960	MHz
TDD-LTE B34	2010-2025	2010-2025	MHz
TDD-LTE B39	1880 - 1920	1880 - 1920	MHz
TDD-LTE B40	2300 - 2400	2300 - 2400	MHz
TDD-LTE B41	2535 - 2655	2535 - 2655	MHz

6.2 TX Power and RX Sensitivity

Table 6-2 N706-CB RF transmit power

Frequency band	Max power	Min. power
FDD-LTE B1	23 dBm \pm 2 dB	< -40 dBm
FDD-LTE B3	23 dBm \pm 2 dB	< -40 dBm
FDD-LTE B5	23 dBm \pm 2 dB	< -40 dBm
FDD-LTE B8	23 dBm \pm 2 dB	< -40 dBm
TDD-LTE B34	23 dBm \pm 2 dB	< -40 dBm
TDD-LTE B39	23 dBm \pm 2 dB	< -40 dBm

TDD-LTE B40	23 dBm±2 dB	< -40 dBm
TDD-LTE B41	23 dBm±2 dB	< -40 dBm

Table 6-3 RX sensitivity

Frequency band	RX sensitivity	Unit
FDD-LTE B1	≤ -97	dBm
FDD-LTE B3	≤ -96	dBm
FDD-LTE B5	≤ -97	dBm
FDD-LTE B8	≤ -97	dBm
TDD-LTE B34	< -99	dBm
TDD-LTE B39	≤ -99	dBm
TDD-LTE B40	≤ -98	dBm
TDD-LTE B41	≤ -98	dBm



The preceding indicators are tested in a shielded environment in a laboratory. The LTE band indicators are the test results when the bandwidth is 10 MHz, the modulation mode is QPST and RB is set according to the protocol. On no-shielded environments, deviations may exist in the receiver sensitivity of some individual bands due to the interference.

6.3 GNSS Technical Parameters

Table 6-4 GNSS technical parameters

Parameter	Notice
GPS L1 operating frequency	1575.42±1.023 MHz
GLONASS operating frequency	1597.5 - 1605.9 MHz
BDS operating frequency	1559.1 - 1563.1 MHz
Tracking sensitivity	TBD
Acquisition sensitivity	TBD
Positioning accuracy (open space)	TBD
Hot start (open space)	TBD
Cold start (open space)	TBD

Update frequency	TBD
Max. positioning altitude	TBD
Max. positioning speed	TBD
Max. positioning acceleration	TBD
CNRin/CNRout	TBD
GNSS data type	TBD
GNSS antenna type	Passive/active antenna



The tracking sensitivity, and recapture sensitivity are obtained from the signaling test on GSS7000. The values are the maximum values obtained from multiple measurements performed on samples. External LNA was used during the test.

6.4 WLAN Characteristics

Table 6-5 WLAN TX power and RX sensitivity

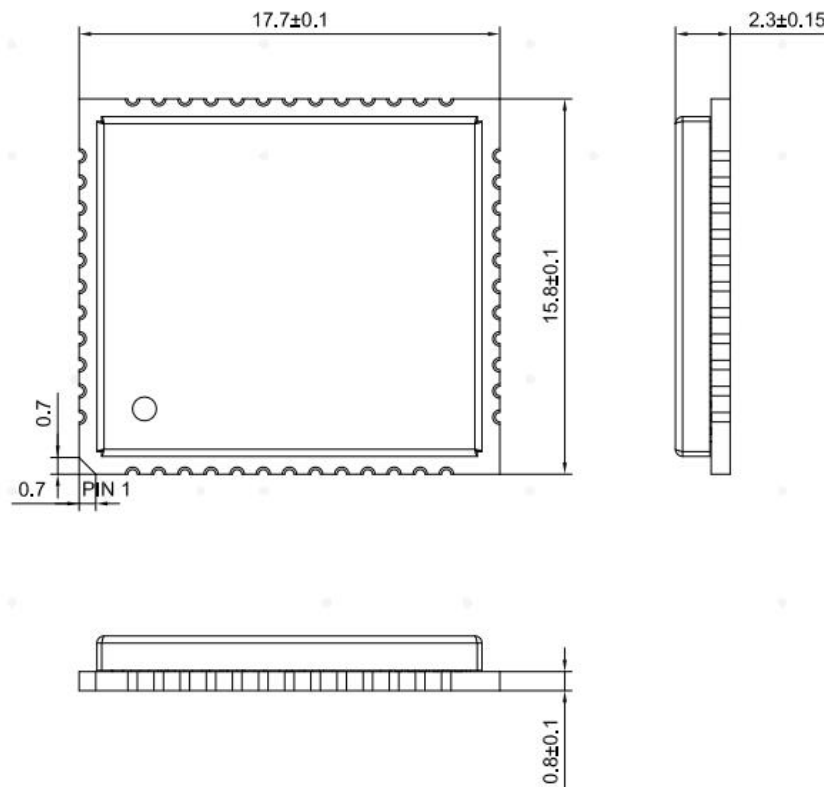
Operating frequency band	Transmitting rate	TX power	RX sensitivity
802.11b (2.4G)	1/2/5.5/11 Mbps	N/A	-98 dBm

7 Mechanical Characteristics

This chapter introduces mechanical characteristics of N706-CB.

7.1 Dimensions

Figure 7-1 Top and side view dimensions (unit: mm)



7.2 Labeling

N706-CB module labels are laser-engraved and can withstand high temperatures of up to 260°C.

Figure 7-2 N706-CB label



The above figure is for reference only. For authentic appearance, please refer to the module that you receive from Neoway.

7.3 Packaging

N706 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.

7.3.1 Reel

Neoway modules are delivered as reeled tapes as shown below:



7.3.2 Moisture Sensitivity Level



N706-CB modules are Moisture Sensitive Devices (MSD) in accordance to the IPC/JEDEC specification.

The Moisture Sensitivity Level (MSL) relates to the required packaging and handling precautions. The MSL standard is available in IPC/JEDEC J-STD-020.

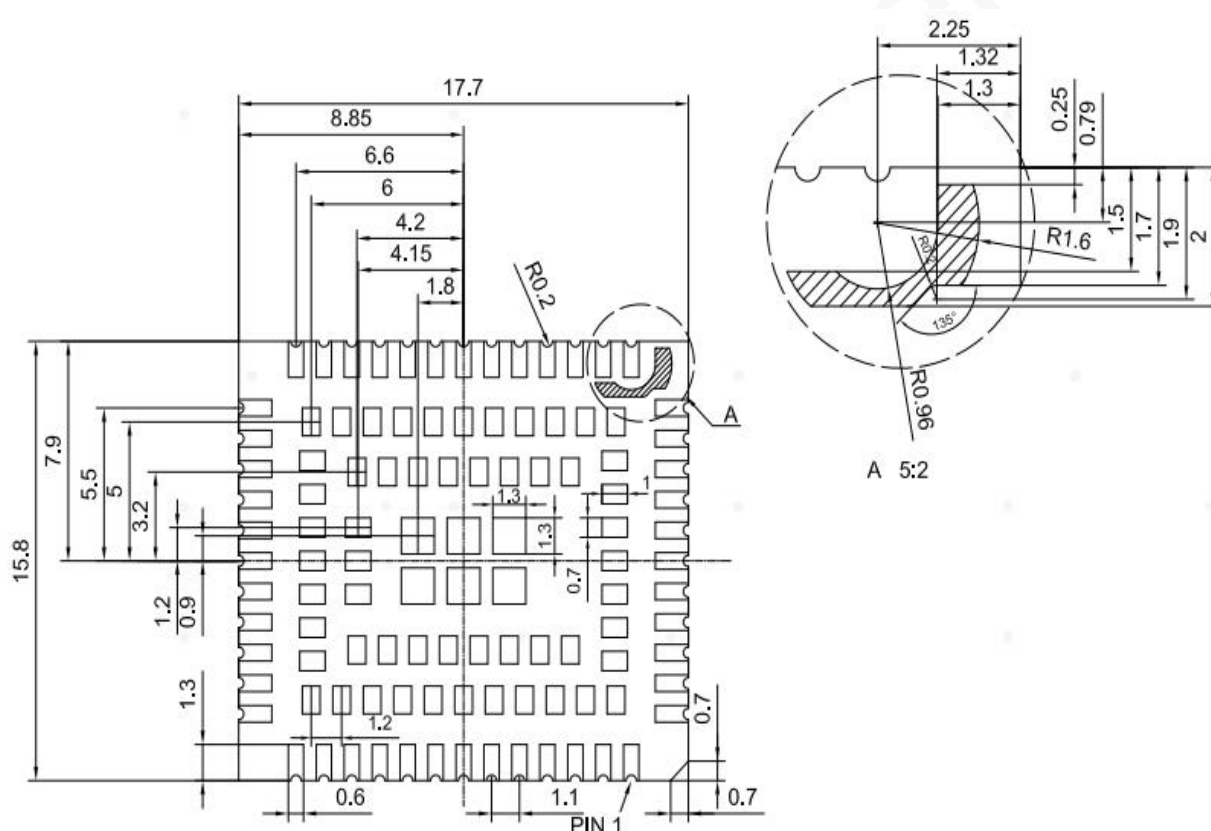
After the module is unpacked, if it is exposed to air for a long time, the module will get damped, and may be damaged during reflow soldering or laboratory soldering. Bake it before mounting the module. The baking conditions depend on the moisture degree. It is recommended to bake the module at temperatures higher than 90 degrees for more than 12 hours. Do not bake Neoway modules while contained in a tape and rolled up in reels. For baking, place modules individually onto the oven tray.

8 Mounting N706-CB onto Application Board

This chapter describes the package of N706-CB, the recommended footprint of the application PCB, and SMT specifications.

8.1 N706-CB PCB Package

Figure 8-1 Bottom view of N706-CB PCB package (unit: mm)



8.2 Application PCB Package

N706-CB is equipped with 109 pads, which are introduced in LCC + LGA package.

The recommended stencil thickness is at least 0.15 mm to 0.20 mm, which can be fine-tuned according to the actual situation.

It is recommended to use the same kind of leaded solder paste used during the production process of Neoway.

- The melting point of the leaded solder paste is 35°C lower than that of the lead-free solder paste, and the temperature in the reflow process is also lower than that of the lead-free solder paste. Therefore, the soldering time is shorter accordingly, which easily causes a false solder because LCC/LGA in the module is in a semi-melted state during the secondary reflow.
- When using only solder pastes with lead, please ensure that the time above 220°C (reflow temperature) exceeds 45 seconds and the peak temperature does not exceed 240°C.

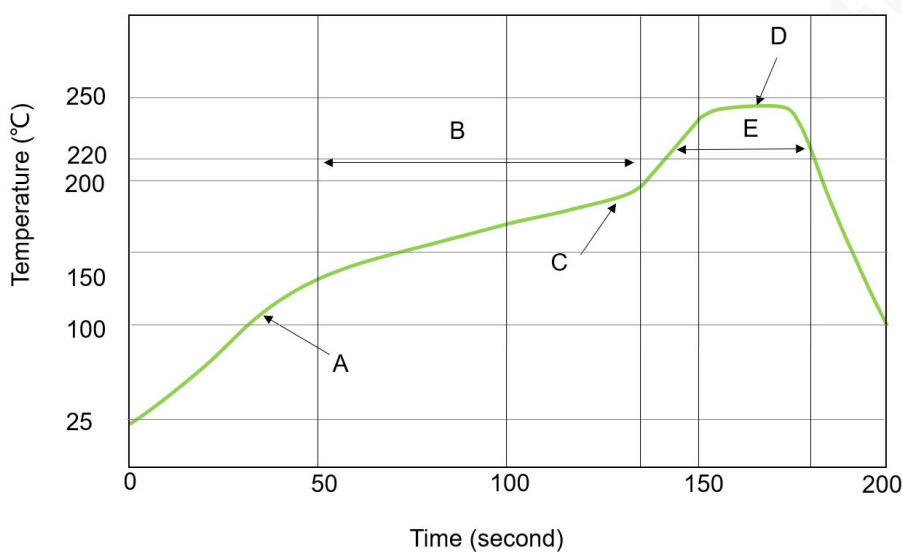
8.5 Oven Temperature Profile



Neoway will not provide warranties for temperature-sensitive element abnormalities caused by improper temperature control.

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 8-3 Oven temperature profile



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 - 100s
- Reflow zone: >220°C, Time: 40 - 90s
- Peak temperature: 235 – 245°C

For information about cautions in storage and mounting, refer to *Neoway_Reflow_Soldering_Guidelines_For_Surface-Mounted_Modules*.

When removing the module manually from your application PCB board is required, use heat guns with great opening, adjust the temperature to about 245°C (depending on the type of the solder paste), and heat the module till the solder paste is melted. Then remove the module using tweezers. Do not shake the module at high temperatures while removing it. Otherwise, the components inside the module might get misplaced.

A Abbreviations

Abbreviation	Full name
ADC	Analog-to-Digital Converter
AI	Analog Input
AO	Analog Output
AIO	Analog Input/Output
ARM	Advanced RISC Machine
BT	Bluetooth
bps	Bits per Second
CCC	China Compulsory Certification
CEP	Circular Error Probable
CNR	Carrier to Noise Rate
CS	Chip Select
CTS	Clear to Send
DC	Direct Current
DCS	Digital Cellular System
DI	Digital Input
DIO	Digital Input/Output
DL	Downlink
DO	Digital Output
DPSK	Differential Phase Shift Keying
DQPSK	Differential Quadrature Phase Shift Keying
DRX	Discontinuous Reception
DTR	Data Terminal Ready
ECM	Ethernet Control Model
eDRX	Extended DRX
EGSM	Enhanced GSM
ESD	Electronic Static Discharge
ESR	Equivalent Series Resistance

EVK	Evaluation Kit
FDD	Frequency Division Duplexing
FPC	Flexible Printed Circuit
FTP	File Transfer Protocol
GFSK	Gauss Frequency Shift Keying
GLONASS	GLOBAL NAVIGATION SATELLITE SYSTEM
GNSS	Global Navigation Satellite System
GPIO	General Purpose Input Output
3GPP	3rd Generation Partnership Project
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile Communications
I2C	Inter-Integrated Circuit
IO	Input/Output
ISP	Image Signal Processor
LCC	Leadless Chip Carriers
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LGA	Land Grid Array
LTE	Long Term Evolution
MCLK	Main Clock
MCU	Microcontroller Unit
MIC	Microphone
PCB	Printed Circuit Board
PCS	Personal Communications Service
PWM	Pulse Width Modulation
QVGA	Quarter Video Graphics Array
RAM	Random Access Memory
RF	Radio Frequency
ROM	Read-only Memory
RTC	Real Time Clock
SD	Secure Digital
SDIO	Secure Digital Input Output

SPK	Speaker
SPI	Serial Peripheral Interface
TDD	Time Division Duplex
UART	Universal Asynchronous Receiver-Transmitter
UL	Uplink
USB	Universal Serial Bus
USIM	Universal Subscriber Identity Module
VBAT	Battery Voltage
VSWR	Voltage Standing Wave Ratio
Wi-Fi	Wireless Fidelity
WCDMA	Wide-band Code Division Multiple Access
WCI	Wireless Coexistence Interface
WLAN	Wireless Local Area Network