

N723-EA

Product Specifications

Issue 1.0 Date 2022-05-30



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Notice

This document provides guide for users to use N723-EA.

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 N723-EA.




Audience

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

Change History

Issue	Date	Change	Changed By
1.0	2022-04	Initial draft	Zhai Miaomiao

Conventions

Symbol	Indication
	Indicates danger or warning. This information must be followed. Otherwise, a catastrophic module or user device failure or bodily injury may occur.
	Indicates caution. This symbol alerts the user to important points about using the module. If these points are not followed, the module or user device may fail.
	Indicates instructions or tips. This symbol provides advices or suggestions that may be useful when using the module.

Related Documents

Neoway_N723-EA_Datasheet

Neoway_N723-EA_Product_Specifications

Neoway_N723-EA_AT_Commands_Mannual

Neoway_N723-EA_EVK_User_Guide

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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.

Please 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.
- 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 touching the pins of the module directly in case of damages caused by ESD.
- Do not insert/remove a SIM card or move a memory card from the module while it is still switched on.

2 About N723-EA

This chapter introduces product overview, block diagram, and basic features of N723-EA.

2.1 Product Overview

N723-EA is an industry-grade cellular module that supports LTE-FDD, LTE-TDD, WCDMA, and GSM. N723-EA has dimensions of (30.00±0.10) mm × (28.00±0.10) mm × (2.95±0.20) mm and supports PHY chip with external RMII interface, SD card, WLAN chip with SDIO interface, and Codec chip with PCM/I2S interface. It is suitable for developing IoT communication devices such as wireless meter reading terminals, vehicle/handheld POS, industrial routers and so on.

N723-EA has the following characteristics:

- ARM Cortex-R5 processors, 832 MHz main frequency at most, 32 kB L1 command cache, 32 kB L1 data cache
- Supported network modes: LTE Cat. 4, WCDMA, GSM.
- Supported interfaces: I2S/PCM, RMII, USIM, USB2.0, UART, SDIO, SD/eMMC, I2C, SPI.

Table 2-1 lists the variant and frequency bands that N723-EA supports.

Table 2-1 Variant and frequency bands

Variant	Region	Category	Band	GNSS	Codec
EA	Europe	Cat.4	FDD-LTE: B1, B3, B5, B7, B8, B20, B28 TDD-LTE: B38, B40, B41 WCDMA: B1, B5, B8 GSM/GPRS/EDGE: 900/1800 MHz	Not supported	Not supported

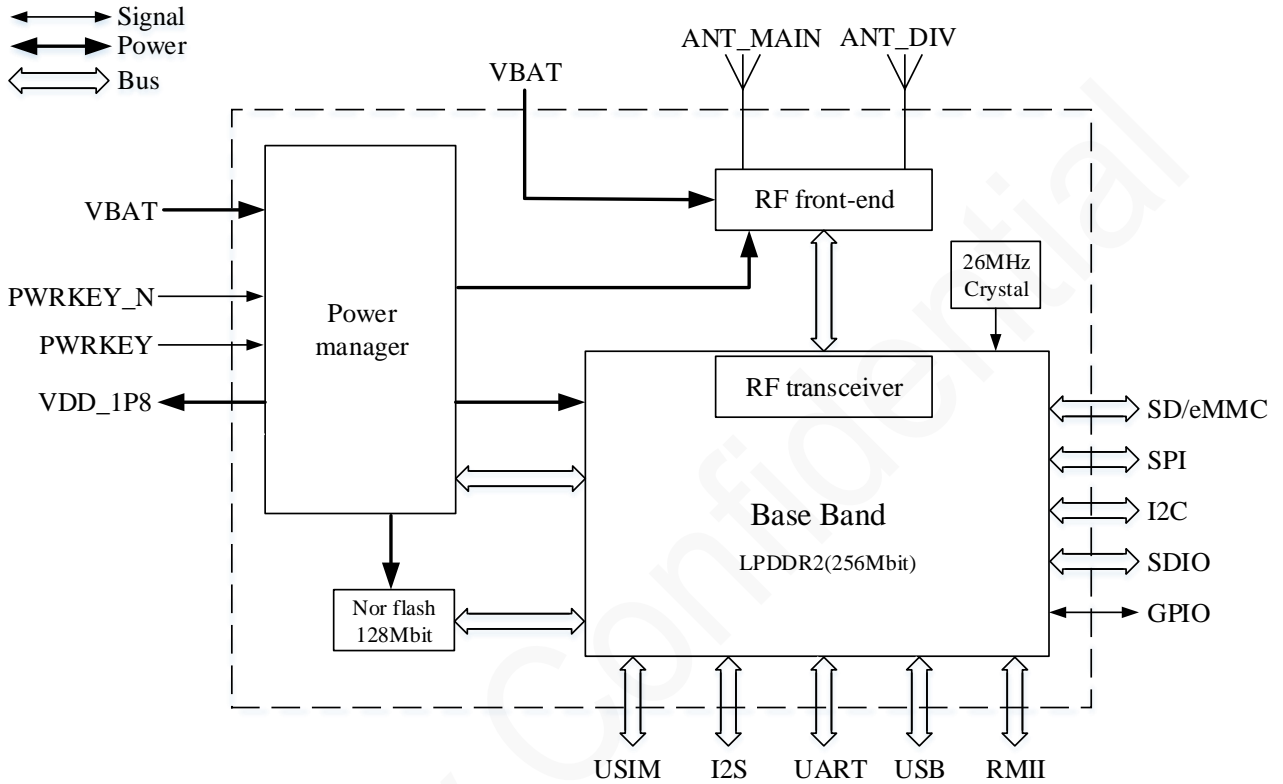
2.2 Block Diagram

N723-EA consists of the following functionality units:

- Baseband
- Power management

- Radio frequency
- Flash storage
- Digital interfaces (I2S/PCM, RMI, USIM, USB2.0, UART, SDIO, SDC, I2C, SPI, and GPIO)

Figure 2-1 Block diagram



2.3 Basic Features

Parameter	Description
Physical features	<ul style="list-style-type: none"> • Dimensions: (30.00±0.10) mm × (28.00±0.10) mm × (2.95±0.20) mm • Package: LGA • Weight: about 5.10 g
Temperature ranges	Operating: -30°C to +75°C Extended ¹⁾ : -40°C ~ +85°C Storage: -40°C to +90°C
Operating voltage	VBAT: 3.4 V- 4.2 V, typical value: 3.8 V
Operating current	Sleep ²⁾ : ≤ 4.0 mA Idle ³⁾ : ≤ 31 mA Operating ⁴⁾ (LTE mode): ≤ 630mA

Application processor	ARM Cortex-R5 processor, 832 MHz main frequency at most, 32 kB L1 command cache, 32 kB L1 data cache
Memory	RAM: 256 Mbit ROM: 128 Mbit
Band	See Table 2-1.
Wireless rate	GPRS: Max 85.6 Kbps (DL)/Max 85.6 Kbps (UL) EDGE: Max 236.8 Kbps (DL)/Max 236.8 Kbps (UL) WCDMA: HSPA+, Max 21 Mbps (DL)/Max 5.76 Mbps (UL) LTE-FDD: Cat4, no-CA, Max 150 Mbps (DL)/Max 50M bps (UL) LTE-TDD: Cat4, no-CA, Max 130 Mbps (DL)/Max 30 Mbps (UL)
Transmit power	EGSM900: +33 dBm (Power Class 4) DCS1800: +30 dBm (Power Class 1) EDGE 900 MHz: +27 dBm (Power Class E2) EDGE1800 MHz: +26 dBm (Power Class E2) WCDMA: +23 dBm (Power Class 3) LTE: +23 dBm (Power Class 3)
Application Interfaces	2G/3G/4G antenna, 4G diversity RX antenna. All of each has a characteristic impedance of 50 Ω.
	Three UART interfaces, one of which is a Debug UART interface.
	One USIM interface, 1.8 V/3.0 V adaptive
	One USB 2.0 interface
	One SDIO interface, used for WLAN
	One SD/eMMC interface, used for SD card or eMMC
	One PCM/I2S interface
	One RMII interface
	One SPI interface, host mode only
One I2C interface, master mode only	
Four GPIO interfaces	
AT commands	3GPP Release 9 Neoway extended commands
SMS	PDU, TXT
Data	PPP, RNDIS
Protocol	TCP/TCPS, UDP, HTTP/HTTPS, FTP, MQTT
Certification approval	CE, RoHS



- “extended¹⁾” The module can be registered on the network, but some indicators cannot meet 3GPP standards.
 - “Sleep mode²⁾”: the module enters a low power consumption state. In this state, the peripheral interface of the module is disabled, but the radio frequency (RF) is functioning properly. The module will exit the sleep mode when there is an incoming call or SMS message, and will re-enter the sleep mode at the end of the incoming call or conversation.
 - “Standby mode³⁾”: the module is in normal working state, but there is no on-going data service.
 - “Operating mode⁴⁾” : current refers to the working current of the module when there is data communication. Only the currents in LTE mode are listed here. For details about currents under other network standards, see the N723-EA current test report.
-

3 Reference Standards

N723-EA is designed by referring to the following standards:

- 3GPP TS 36.521-1 V9.10.0 User Equipment(UE) conformance specification; Radio transmission and reception; Part 3: Radio Resource Management (RRM) conformance testing
- 3GPP TS 21.111 V9.0.0 USIM and IC card requirements
- 3GPP TS 31.102 V9.19.0 Characteristics of the Universal Subscriber Identity Module (USIM) application
- 3GPP TS 31.111 V9.12.2 Universal Subscriber Identity Module (USIM) Application Toolkit (USAT)
- 3GPP TS 27.007 V9.9.0 AT command set for User Equipment (UE)
- 3GPP TS 27.005 V9.0.1 Use of Data Terminal Equipment – Data Circuit terminating Equipment (DTE - DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)

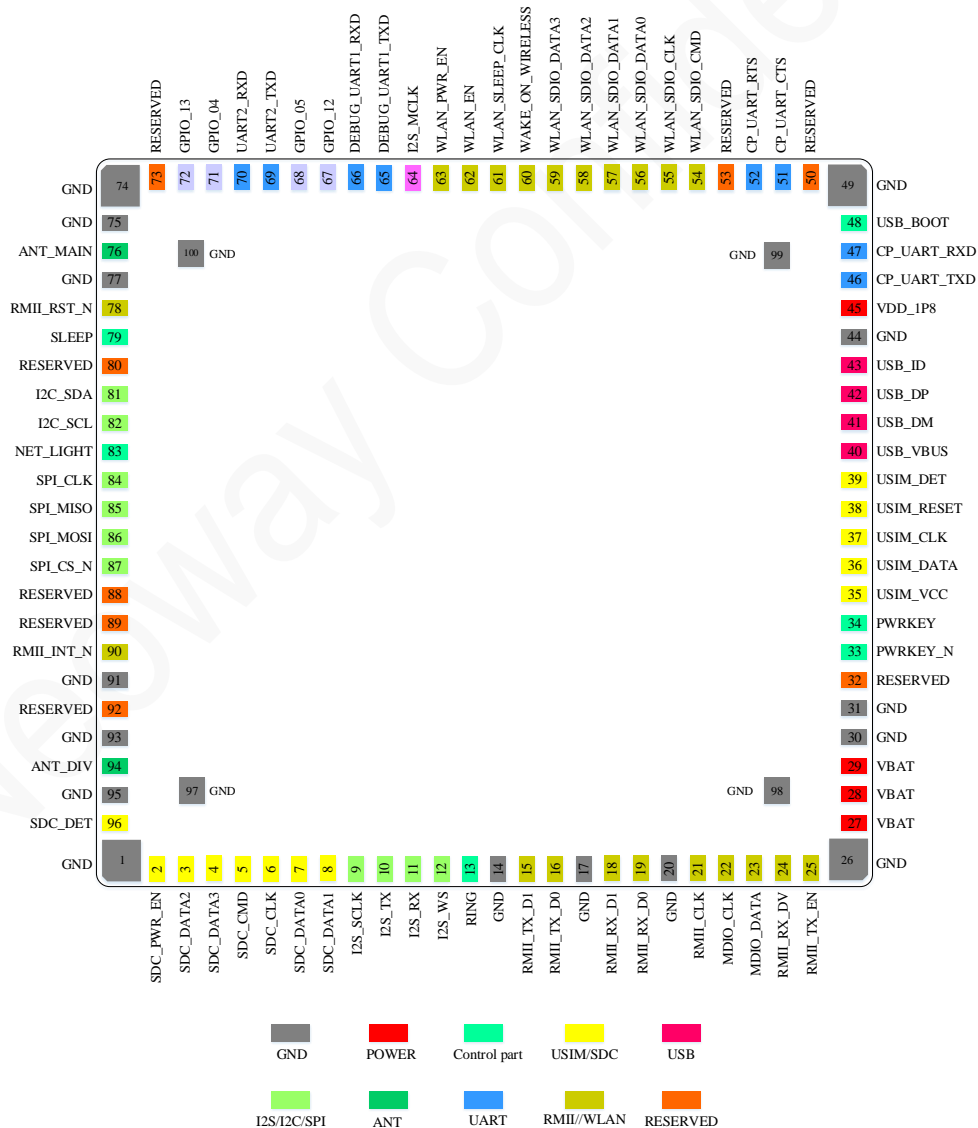
4 Module Pins

The N723-EA module has a total of 100 pins, adopts the LGA package, and supports the functional interfaces including power supply, USB, USIM, UART, I2C, SPI, RMII, SDIO, and so on.

4.1 Pin Layout

Table 2-1 shows the N723-EA pin layout:

Figure 4-1 N723-EA pin definition (Top view)





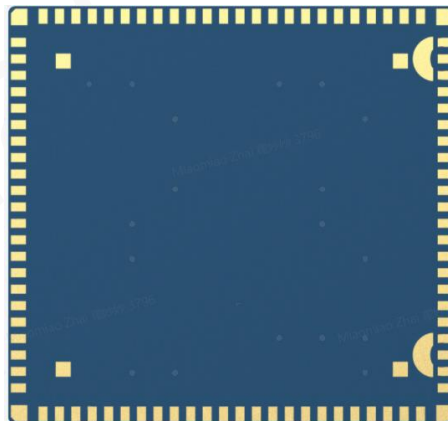
- If you need to use the I2S or RMII function, contact Neoway FAEs.
- This pin can be pulled down only after the module initialization process is completed.
- RMII only supports 1.8V level by default. If supporting 3.3 V level is required, ensure that the hardware supports it.
- All the RESERVED and Ground pins must be left floating.

4.2 Module Appearance

Figure 4-2 Top view of N723-EA



Figure 4-3 Bottom view of N723-EA



The label and bottom views of the N723-EA module in the above picture are for reference only. Detailed information is in accordance with the final product.

5 Electrical Characteristics and Reliability

5.1 Electrical Characteristics



- If the voltage is lower than 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.
- If you use LDO or DC-DC to supply power for the module, ensure that it outputs at least 2.5 A current.

Table 5-1 N723-EA operating conditions

Parameter		Minimum Value	Typical Value	Maximum Value
VBAT	V _{in}	3.4 V	3.8 V	4.2 V
	I _{in}	N/A	N/A	2.5 A

5.2 Temperature Characteristics

Table 5-2 N723-EA temperature characteristics

Parameter	Minimum Value	Typical Value	Maximum Value
Operating	-30°C	25°C	75°C
Extended	-40°C	25°C	85°C
Storage	-40°C	25°C	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 but it can still work properly.

5.3 ESD Protection

Electronic products generally need to undergo strict ESD testing. The following is the ESD protection capability (the data is obtained from the test performed using the N723-EA EVB) 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.

Humidity 45% Temperature 25°C

Table 5-3 N723-EA ESD protection characteristics

Testing Point	Contact Discharge	Air Discharge
GND	±8 kV	±15 kV
ANT	±8 kV	±15 kV
Cover	±8 kV	±15 kV

6 RF Characteristics

N723-EA supports GSM, WCDMA, FDD-LTE, and TDD-LTE (Cat.4) network modes. This chapter describes the RF characteristics of N723-EA.

6.1 Operating Band

Table 6-1 N723-EA operating bands

Operating Band	Uplink	Downlink
EGSM900	880 - 915 MHz	925 - 960 MHz
DCS1800	1710 - 1785 MHz	1805 - 1880 MHz
WCDMA B1	1920 - 1980 MHz	2110 - 2170 MHz
WCDMA B5	824 - 849 MHz	869 - 894 MHz
WCDMA B8	880 - 915 MHz	925 - 960 MHz
FDD-LTE B1	1920 - 1980 MHz	2110 - 2170 MHz
FDD-LTE B3	1710 - 1785 MHz	1805 - 1880 MHz
FDD-LTE B5	824 - 849 MHz	869 - 894 MHz
FDD-LTE B7	2500 - 2570 MHz	2620 - 2690 MHz
FDD-LTE B8	880 - 915 MHz	925 - 960 MHz
FDD-LTE B20	832 - 862MHz	791 - 821 MHz
FDD-LTE B28	703 - 748 MHz	758 - 803 MHz
TDD-LTE B38	2570 - 2620 MHz	2570 - 2620 MHz
TDD-LTE B40	2300 - 2400 MHz	2300 - 2400 MHz
TDD-LTE B41	2535 - 2655 MHz	2535 - 2655 MHz

6.2 TX Power and RX Sensitivity

Table 6-2 N723-EA RF TX power

Band	Max Power	Min. Power
EGSM900	33 dBm±2 dB	5 dBm±5 dB
DCS1800	30 dBm±2 dB	5 dBm±5 dB

WCDMA B1	23 dBm+1/-3 dB	<-50 dBm
WCDMA B5	23 dBm+1/-3 dB	<-50 dBm
WCDMA B8	23 dBm+1/-3 dB	<-50 dBm
FDD LTE B1	23 dBm±2 dB	<-39 dBm
FDD LTE B3	23 dBm±2 dB	<-39 dBm
FDD LTE B5	23 dBm±2 dB	<-39 dBm
FDD LTE B7	23 dBm±2 dB	<-39 dBm
FDD LTE B8	23 dBm±2 dB	<-39 dBm
FDD LTE B20	23 dBm±2 dB	<-39 dBm
FDD LTE B28	23 dBm±2 dB	<-39 dBm
TDD LTE B38	23 dBm±2 dB	<-39 dBm
TDD LTE B40	23 dBm±2 dB	<-39 dBm
TDD-LTE B41	23 dBm±2 dB	<-39 dBm

Table 6-3 GSM RX sensitivity of N723-EA

Band	Receiving Sensitivity
EGSM900	≤-108 dBm
DCS1800	≤-108 dBm

Table 6-4 WCDMA RX sensitivity of N723-EA

Band	Receiving Sensitivity
WCDMA B1	≤-108 dBm
WCDMA B5	≤-108 dBm
WCDMA B8	≤-108 dBm

Table 6-5 LTE RX sensitivity of N723-EA

Band	Receiving Sensitivity	Duplex Mode
LTE B1	≤-97 dBm	FDD
LTE B3	≤-97 dBm	FDD
LTE B5	≤-97 dBm	FDD
LTE B7	≤-96.5 dBm	FDD

LTE B8	≤ -97.5 dBm	FDD
LTE B20	≤ -97.5 dBm	FDD
LTE B28	≤ -97.5 dBm	FDD
LTE B38	≤ -97.5 dBm	TDD
LTE B40	≤ -97.5 dBm	TDD
LTE B41	≤ -97.5 dBm	TDD



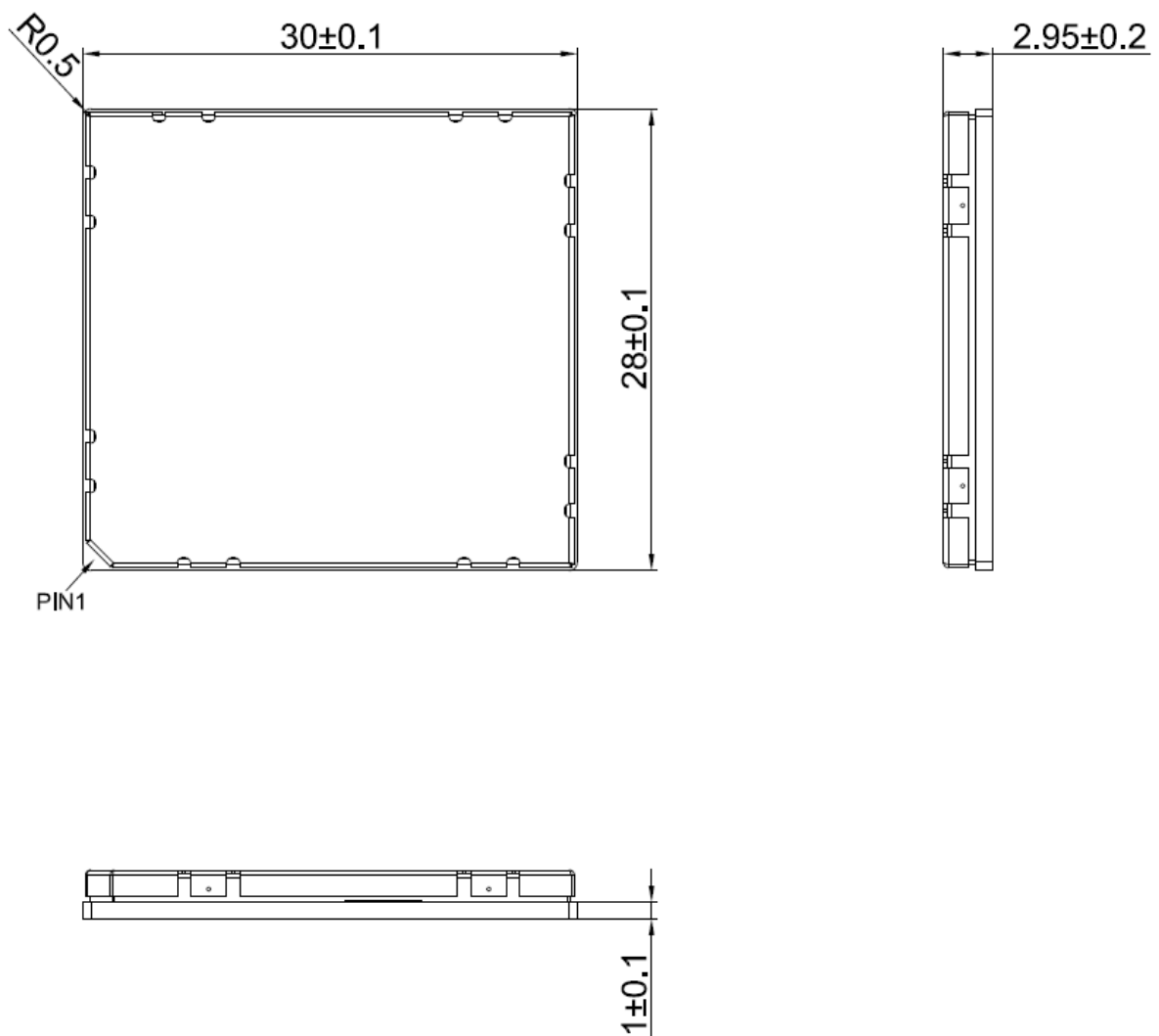
The preceding indexes are test data in a laboratory environment. The test results of LTE (Cat. 4) in a bandwidth of 10 MHz will have a certain deviation due to the influence of the network environment.

7 Mechanical Characteristics

This chapter describes mechanical characteristics of the N723-EA module.

7.1 Dimensions

Figure 7-1 Top and side view dimensions N723-EA (unit: mm)



7.2 Label

The label information is laser carved on the cover. The following figure shows the label of N723-EA.



The picture above is only for reference.

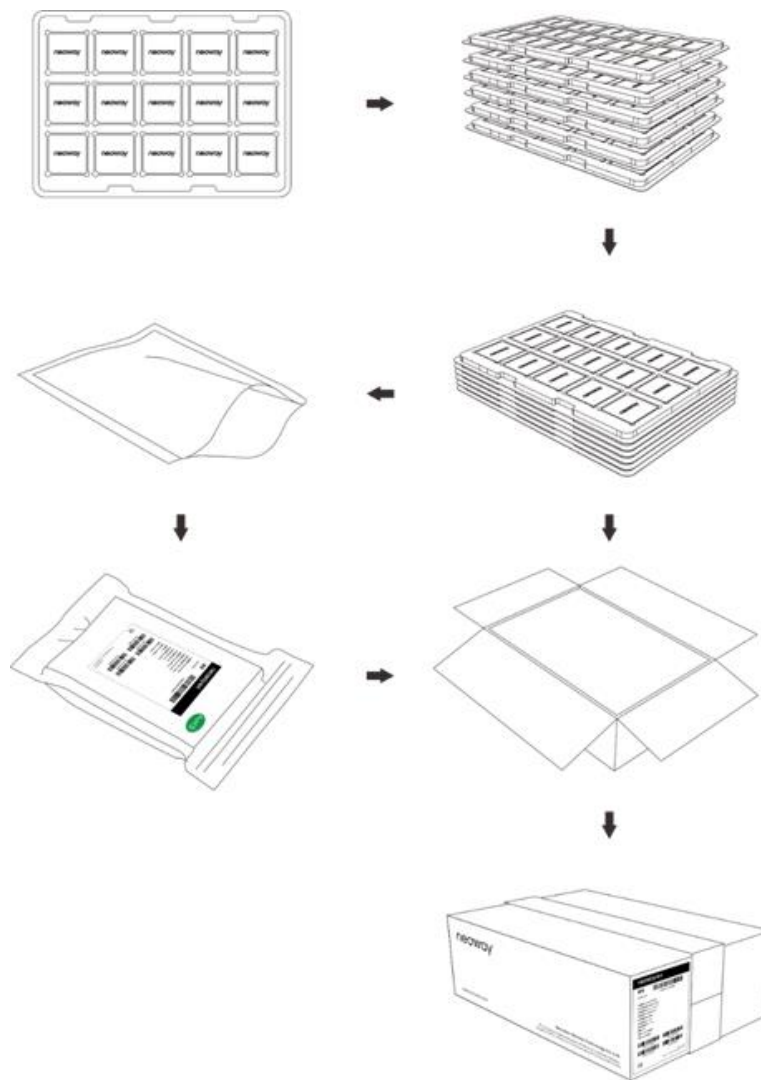
7.3 Packing

N723-EA 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 Tray

The mass-produced N723-EA is packaged and shipped using the following tray method:

Figure 7-2 Packing process



The picture above is only for reference.

7.3.2 Moisture

N723-EA is a level 3 moisture-sensitive electronic element, in compliance with IPC/JEDEC J-STD-020 standard.

After the module is unpacked, if it is exposed to the air for a long time, the module will get damp, 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 a temperature higher than 90 degrees for more than 12 hours. In addition, since the package tray is made of non-high temperature resistant material, do not bake modules with the package tray directly.

8 Mounting

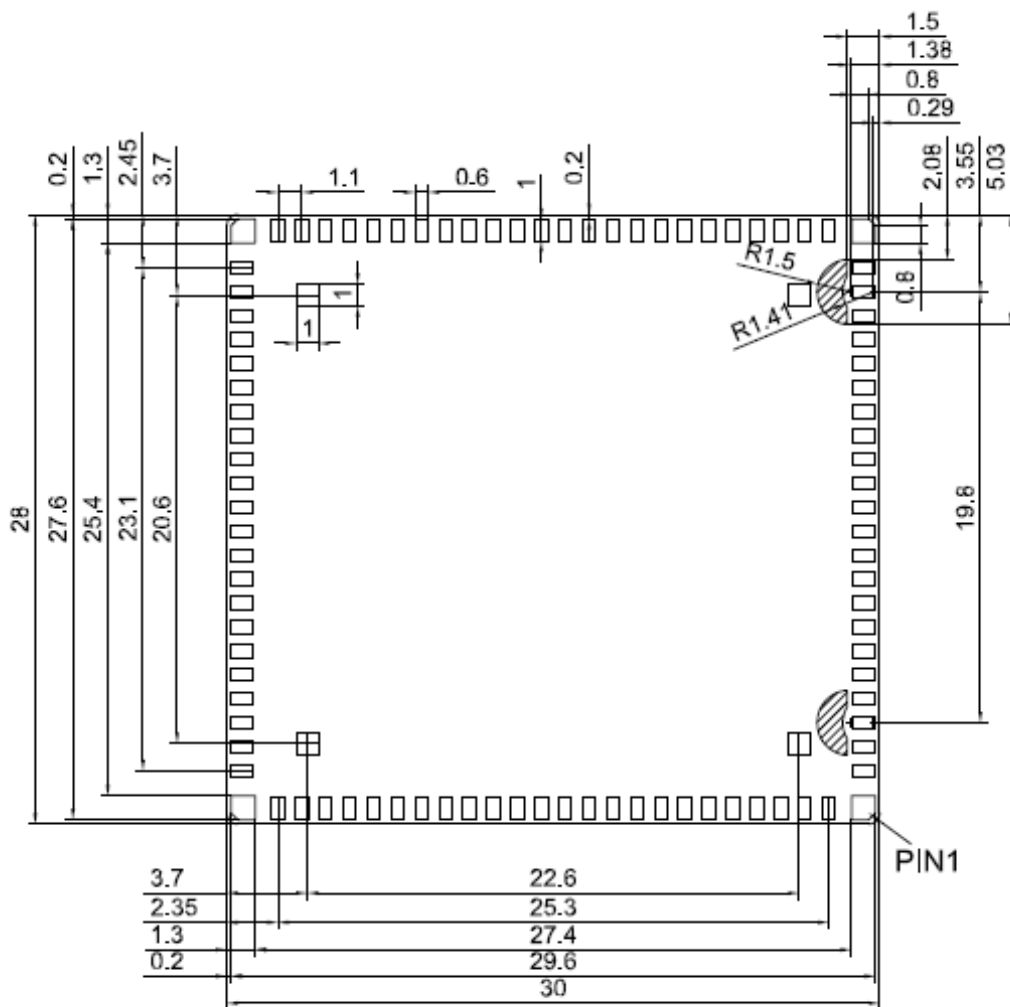
N723-EA has 100 pins and uses the LGA package.

8.1 PCB Package



Only GND via-holes and pour coppers are allowed in the shaded area "A" of the PCB package to ensure the proper operation of the module.

Figure 8-1 N723-EA bottom view of PCB package (unit: mm)



8.2 Stencil

The recommended stencil thickness is at least 0.15 mm to 0.20 mm.

8.3 Solder Paste

The thickness of the solder paste and the flatness of the PCB are essential for the production yield.

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 parameters 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 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 reflow temperature is kept at 220 °C for more than 45 seconds and the peak temperature reaches 240 °C.

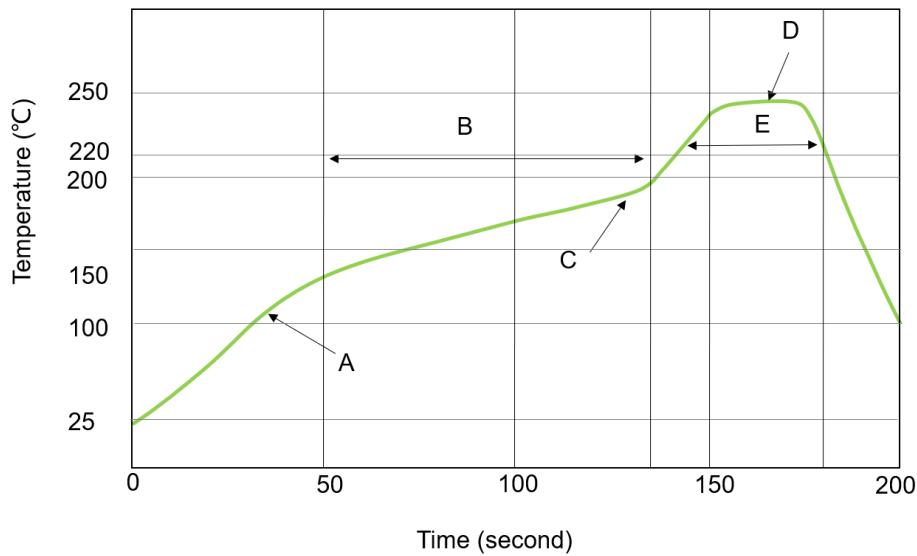
8.4 SMT Oven Temperature Profile



Neoway will not provide warranty for heat-responsive 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 8-2 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: 60-100 s
- Reflow zone: >220 °C, Time: 40-90 s
- Peak temperature: 235-245°C

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

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 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 Abbreviation

Abbreviation	Full name
AI	Analog Input
AO	Analog Output
ARM	Advanced RISC Machine
bps	Bits per Second
CCC	China Compulsory Certification
CS	Chip Select
CTS	Clear to Send
DC	Direct Current
DCS	Digital Cellular System
DI	Digital Input
DL	Downlink
DO	Digital Output
DRX	Discontinuous Reception
EGSM	Enhanced GSM
ESD	Electronic Static Discharge
ESR	Equivalent Series Resistance
EVK	Evaluation Kit
FDD	Frequency Division Duplexing
GNSS	Global Navigation Satellite System
GPIO	General Purpose Input Output
3GPP	3rd Generation Partnership Project
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
I2C	Inter-Integrated Circuit
IO	Input/Output
LCC	Leadless Chip Carriers
LED	Light Emitting Diode

LGA	Land Grid Array
LTE	Long Term Evolution
MCLK	Main Clock
MCU	Microcontroller Unit
PCB	Printed Circuit Board
PWM	Pulse Width Modulation
RAM	Random Access Memory
RF	Radio Frequency
ROM	Read-only Memory
SDIO	Secure Digital Input Output
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
WiFi	Wireless Fidelity
WCDMA	Wide-band Code Division Multiple Access
WLAN	Wireless Local Area Network
