

# N720 Mini PCIe Specifications

Version 1.3



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**Notice**

This document provides guide for users to use *N720 Mini PCIe*.

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

The information in this document is subject to change without notice due to product version update or other reasons.

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<b>Revision Record</b>		
<b>Issue</b>	<b>Date</b>	<b>Changes</b>
V1.0	2016-08	Initial draft
V1.1	2016-10	Added CDMA band
V1.2	2017-04	modify the UIM card part, delete the UIM2 introduction improve the regional version of the band information modify part of the content description
V1.3	2017-04	modify V_MAIN minimum value

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# 1 Overview

N720 is an industrial grade 4G module that is developed on Qualcomm platform. Its dimensions are 30mm x 28mm x 2.8mm and it is industrial-grade high-performance, ultra-wide operating temperatures from -40 °C to +85 °C, electrostatic capacity of 8KV. It is well applicable for electric terminals, in-vehicle computers, POS, industrial routers, and other IoT terminal switches.

N720 has following features:

- ARM Cortex-A7 processors, 1.2 GHz main frequency, 256 kB L2 cache, 28 nm
- GSM/GPRS/EDGE && CDMA2000@1x/1xAdvanced/1xEV-DO or A && WCDMA R99 to DC-HSPA+ && TD-SCDMA && LTE Cat4
- USB2.0/SIM/ADC/UART

N720 series include the following models:



NOTE

CN: China JP: Japan EU: Europe US: the United States

**Table 1-1** Configuration and bands

Band Version	LTE															
	B1	B2	B3	B4	B5	B7	B8	B9	B17	B19	B20	B28	B38	B39	B40	B41
CN	•		•		•		•					•	•	•	•	•
JP	•		•				•	•		•						
EU	•		•		•	•	•				•				•	
US		•		•	•	•			•							

Band Version	UMTS							TD-SCDMA		GSM				CDMA
	B1	B2	B4	B5	B8	B9	B19	B34	B39	850	900	1800	1900	BC0
CN	•				•			•	•		•	•		•
JP	•				•	•	•							
EU	•				•					•	•	•	•	
US		•	•	•						•	•	•	•	

## 2 Compliant Standards

1. 3GPP TS 07.07AT *command set for GSM Mobile Equipment (ME)*
2. YD 1214-2006 *Technical requirement of 900/1800MHz TDMA Digital Cellular Mobile Telecommunication Network General Packet Radio Service (GPRS)Equipment: Mobile Stations*
3. YD 1215-2006*Testing Methods of 900/1800MHz TDMA Digital Cellular Mobile Telecommunication Network General Packet Radio Service (GPRS)Equipment: Mobile Stations*
4. YD 1032-2000*Limits and Measurement Methods of Electromagnetic Compatibility for 900/1800MHz Digital Cellular Telecommunications System Part1:Mobile Station and Ancillary Equipment*
5. YD/T 2220-2011 *Technical Requirement and test method of WCDMA/GSM(GPRS) dual mode digit mobile user equipment (phase 4)*
6. Ministry of Industry and Information Technology PRC, *Measures for the Network Access Management of Telecommunication Equipment (2014 Amendment)*
7. GB4943.1-2011 *Information technology equipment - Safety - Part 1: General requirements*
8. GB/T22450.1-2008 *Limits and measurement methods of electromagnetic compatibility for 900/1800MHz TDMA digital cellular telecommunications system - Part 1: Mobile station and ancillary equipment*
9. CNCA-O7C-031:2007*Rules for Compulsory Certification of Telecommunication Equipment Telecommunication Terminal Equipment*
10. 3GPP TS GSM *Specification Set*
11. 3GPP TS WCDMA *Specification Set*
12. CDMA2000@1x,1xAdvanced,1xEV-DOorA *Specification Set*
13. 3GPP TS LTE Cat4 4G*Specification Set*

## 3 Features

**Table 3-1** N720 Mini PCIe baseband and wireless features

Specifications	Description
Power supply	3.0V to 3.9V, TYP: 3.6V
Current in sleep mode	4mA
Temperature	Operating temperature: -40 °C to +85 °C
Processor	ARM Cortex-A7 processor Main frequency: 1.2 GHz 256kB L2 cache
Band	CN Configuration 1: <ul style="list-style-type: none"> <li>• GSM/GPRS/EDGE 900M/1800M</li> <li>• CDMA BC0</li> <li>• TD-SCDMA B34, B39</li> <li>• UMTS B1, B8</li> <li>• LTE FDD B1, B3, B5, B8</li> <li>• LTE TDD B38, B39, B40, B41</li> </ul> CN Configuration 2: <ul style="list-style-type: none"> <li>• GSM/GPRS/EDGE 900M/1800M</li> <li>• TD-SCDMA B34, B39</li> <li>• UMTS B1, B8</li> <li>• LTE FDD B1, B3, B5, B8</li> <li>• LTE TDD B38, B39, B40, B41</li> </ul> CN Configuration 3: <ul style="list-style-type: none"> <li>• GSM/GPRS/EDGE 900M/1800M</li> <li>• TD_SCDMA B34, B39</li> <li>• UMTS B1, B8</li> <li>• LTE FDD B1, B3, B8, B28</li> <li>• LTE TDD B38, B39, B40, B41</li> </ul> JP: <ul style="list-style-type: none"> <li>• UMTS B1, B8, B9, B19</li> <li>• LTE FDD B1, B3, B8, B9, B19</li> </ul> EU: <ul style="list-style-type: none"> <li>• GSM/GPRS/EDGE 850M/ 900M/1800M/1900M</li> <li>• UMTS B1, B8</li> <li>• LTE FDD B1,B3,B5, B7, B8, B20</li> <li>• LTE TDD B40</li> </ul> US:

	<ul style="list-style-type: none"> <li>• GSM/GPRS/EDGE 850M/ 900M/1800M/1900M</li> <li>• UMTS B2, B4, B5</li> <li>• LTE FDD B2, B4, B5, B7, B17</li> </ul>
Rate	<ul style="list-style-type: none"> <li>• GPRS: Max 85.6Kbps(DL) / Max 85.6Kbps(UL)</li> <li>• CDMA: Max 3.1Mbps(DL)/Max 1.8Mbps(UL)</li> <li>• WCDMA: DC-HSPA+, Max 42Mbps(DL)/Max 5.76Mbps(UL)</li> <li>• TD-SCDMA: Max 4.2Mbps(DL)/Max 2.2Mbps(UL)</li> <li>• LTE FDD: non-CA cat4, Max 150Mbps(DL)/Max 50Mbps(UL)</li> <li>• LTE TDD: non-CA cat4 ,Max 130Mbps(DL)/Max 35Mbps(UL)</li> </ul>
Transmit power	<ul style="list-style-type: none"> <li>• GSM850: +33dBm (Power Class 4)</li> <li>• EGSM900: +33dBm (Power Class 4)</li> <li>• DCS1800: +30dBm (Power Class 1)</li> <li>• PCS1900: +30dBm (Power Class 1)</li> <li>• EDGE 850MHz: +27dBm (Power Class E2)</li> <li>• EDGE 900MHz: +27dBm (Power Class E2)</li> <li>• EDGE1800MHz: +26dBm (Power Class E2)</li> <li>• EDGE1900MHz: +26dBm (Power Class E2)</li> <li>• TD-SCDMA:+23dBm (Power Class 3)</li> <li>• CDMA 1X/EVDO:+23dBm(Power Class 3)</li> <li>• UMTS: 23dBm (Power Class 3)</li> <li>• LTE: +23dBm (Power Class 3)</li> </ul>
Antenna feature	50Ω impedance
UART	1 group of UART, at most 4 Mbps
UIM	1 group of UIM interface, 1.8V/3V dual-voltage adaptive
USB	1 group of USB2.0 high-speed interface
ADC	2 groups of 16-bit ADC, input voltage ranging from 0.1 to 1.7V



# 4 Specifications and Pin Definition

## 4.1 Specifications

Table 4-1 N720 dimensions

Specifications	N720
Dimensions	30 mm*28 mm*2.8 mm(H*W*D)
Weight	5.1g
Package	100-Pin LGA

Table 4-2 N720Mini PCIe dimensions

Specifications	N720 Mini PCIe
Dimensions	51mm*30mm*3.9mm(H*W*D)
Weight	9.3g
Package	52-Pin Mini PCIe

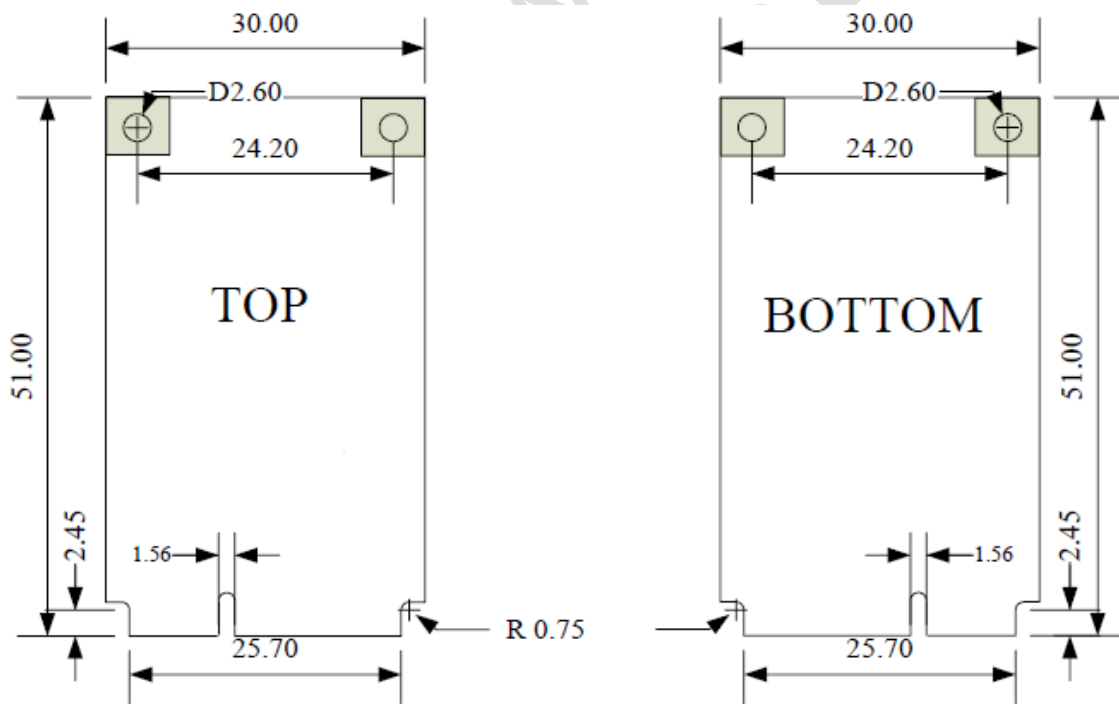


Figure 4-1 N720 Mini PCIe Outline dimensions



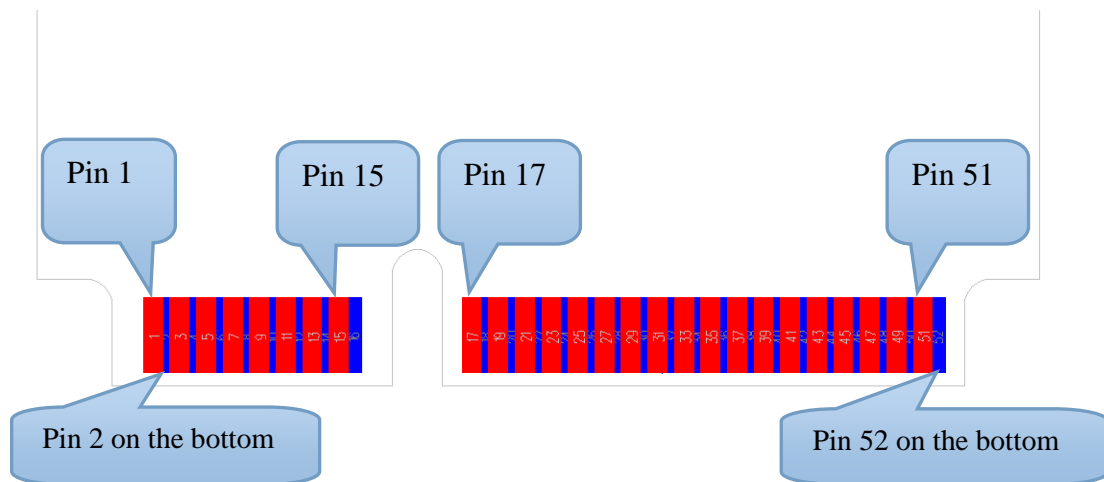
Figure 4-2 N720 Mini PCIe Module physical figure



**CAUTION**

PCB color is according to the actual delivery, the color of the module in this document not as per the standards.

## 4.2 N720 Mini PCIe Pin Definition



### NOTE

- IO: input/output
- DI: Digital input
- DO: Digital output
- PI: Power input
- PO: Power output

Table 4-3 N720 Mini PCIe pin description

Name	Pin	I/O	Function	Level Feature (V)	Power Domain	Remarks
<b>Power Supply and Control foot</b>						
V_MAIN	2, 24, 39, 41, 52	PI	Main power supply input	V <sub>min</sub> =3.0V V <sub>max</sub> =3.9V V <sub>typ</sub> =3.6V		The power supply must be able to provide 3A current.
VREG_1V8	6	PO	1.8 V power supply output	V <sub>norm</sub> =1.8V I <sub>max</sub> =100mA	1.8V	Supply power for IO level shifting circuit. Leave it unconnected if you do not use it.
GND	4, 9, 15, 18, 21, 26, 27, 29, 34, 35, 37, 40, 43, 50		GND			
PON_RESET	22	DI	Reset input	V <sub>IL min</sub> =-0V V <sub>IL max</sub> =0.5V V <sub>IH min</sub> =1.2V V <sub>IH max</sub> =2.1V	1.8V	Low level
<b>UART port</b>						
UART_TX	31	DO	UART data transmit	V <sub>OL max</sub> =0.45V V <sub>OH min</sub> =1.35V	1.8V	Data communication Leave them unconnected if you do not use them. (This group of serial port is used defaultly)
UART_RX	23	DI	UART data receive	V <sub>IL min</sub> =-0.3V V <sub>IL max</sub> =0.45V V <sub>IH min</sub> =1.35V V <sub>IH max</sub> =2.1V	1.8V	
UART_TX	13	DO	UART data transmit Compatible with PIN31, one	V <sub>OL max</sub> =0.45V	1.8V	

			option	$V_{OH\ min}=1.35V$		
UART_RX	11	DI	UART data receive Compatible with PIN23, one option	$V_{IL\ min}=-0.3V$ $V_{IL\ max}=0.45V$ $V_{IH\ min}=1.35V$ $V_{IH\ max}=2.1V$	1.8V	Data communication Leave them unconnected if you do not use them.
CTS	19	DI	Clear to send	$V_{IL\ min}=-0.3V$ $V_{IL\ max}=0.45V$ $V_{IH\ min}=1.35V$ $V_{IH\ max}=2.1V$	1.8V	Leave it unconnected if you do not use it.
RTS	25	DO	Request to send	$V_{OL\ max}=0.45V$ $V_{OH\ min}=1.35V$	1.8V	Leave it unconnected if you do not use it.
<b>UIM Card Port</b>						
V_USIM	8	PO	UIM power supply output	1.8V USIM: $V_{max} = 1.9V$ $V_{min} = 1.7V$ 3V USIM: $V_{max} = 3.05V$ $V_{min} = 2.7V$ $IO\ max = 50mA$	1.8V/3V	Compatible with 1.8/3V UIM card
USIM_RST	14	DO	UIM reset	1.8V USIM: $V_{OL\ max} = 0.45V$ $V_{OH\ min} = 1.35V$ 3V USIM: $V_{OL\ max} = 0.4V$ $V_{OH\ min} = 2.6V$	1.8V/3V	

USIM_DATA	10	IO	UIM data I/O	1.8V USIM: V <sub>IL</sub> max = 0.6V V <sub>IH</sub> min = 1.2V V <sub>OL</sub> max = 0.45V V <sub>OH</sub> min = 1.35V 3V USIM: V <sub>IL</sub> max = 0.8V V <sub>IH</sub> min = 1.95V V <sub>OL</sub> max = 0.45V V <sub>OH</sub> min = 2.6V	1.8V/3V	Compatible with 1.8/3V UIM card Leave them unconnected if you do not use them.
USIM_CLK	12	DO	UIM clock output	1.8V USIM: V <sub>OL</sub> max = 0.45V V <sub>OH</sub> min = 1.35V 3V USIM: V <sub>OL</sub> max = 0.4V V <sub>OH</sub> min = 2.6V	1.8V/3V	
USIM_DETECT	44	DI	UIM detect	V <sub>IL</sub> min = -0.3V V <sub>IL</sub> max = 0.63V	1.8V	
<b>USB port</b>						
USB_D-	36	IO	USB data negative signal	USB2.0		Used for firmware download and data transmission
USB_D+	38	IO	USB data positive signal	USB2.0		Differential trace for DM and DP 90Ω impedance resistance
<b>LED Indicator</b>						
LED_WWAN	42	DO	Indicate network status	V <sub>OL</sub> max=0.45V	1.8V	Leave it unconnected if you do not use it.

				$V_{OH\ min}=1.35V$		
<b>Sleep Mode Control</b>						
WAKE	48	DI	Sleep mode control	$V_{IL\ min}=-0.3V$ $V_{IL\ max}=0.45V$ $V_{IH\ min}=1.35V$ $V_{IH\ max}=2.1V$	1.8V	Leave it unconnected if you do not use it.
<b>RING Signal</b>						
RING	17	DO	Incoming call ring	$V_{OL\ max}=0.45V$ $V_{OH\ min}=1.35V$	1.8V	Leave it unconnected if you do not use it.
<b>Others</b>						
NC	1, 3, 5, 7, 16, 20, 28, 30, 32, 33, 46		NC			Leave them unconnected. Do not use them.

## 5 Reliability Indicators and Test Standards

### 5.1 Temperature and Test Standards

Table 5-1 Temperature and Test Standards

Module Status	Minimum Value	Typical Value	Maximum Value
Work	-35 ℃	25 ℃	75 ℃
Limit	-40 ℃		85 ℃
Storage	-45 ℃		90 ℃



#### CAUTION

When the ambient temperature exceeds the module normal operating temperature, some of the RF performance of the module may deteriorate, but the normal use of the module will not cause a greater impact.

### 5.2 Work Band

Table 5-2 work band

Work band	Uplink	Downlink
GSM850	824~849MHz	869~894MHz
EGSM900	880~915MHz	925~960MHz
DCS1800	1710~1785MHz	1805~1880MHz
PCS1900	1850~1910MHz	1805~1880MHz
CDMA BC0	824~849MHz	869~894MHz
UMTS B1	1920~1980MHz	2110~2170MHz
UMTS B2	1850~1910MHz	1805~1880MHz
UMTS B4	1710~1755MHz	2110~2155MHz
UMTS B5	824~849MHz	869~894MHz
UMTS B8	880~915MHz	925~960MHz
UMTS B9	1749.9~1784.9MHz	1844.9~1879.9MHz
UMTS B19	869~894MHz	869~894MHz
TD-SCDMA B34	2010~2025MHz	2010~2025MHz
TD-SCDMA B39	1880~1920MHz	1880~1920MHz
LTE FDD B1	1920~1980MHz	2110~2170MHz
LTE FDD B2	1850~1910MHz	1805~1880MHz
LTE FDD B3	1710~1785MHz	1805~1880MHz



LTE FDD B4	1710~1755MHz	2110~2155MHz
LTE FDD B5	824~849MHz	869~894MHz
LTE FDD B7	2500~2570MHz	2620~2690MHz
LTE FDD B8	880~915MHz	925~960MHz
LTE FDD B9	1749.9~1784.9MHz	1844.9~1879.9MHz
LTE FDD B17	704~716MHz	734~746MHz
LTE FDD B19	830~845MHz	875~890MHz
LTE FDD B20	832~862MHz	791~821MHz
LTE FDD B28	703~748MHz	758~803MHz
LTE TDD B38	2570~2620MHz	2570~2620MHz
LTE TDD B39	1880~1920MHz	1880~1920MHz
LTE TDD B40	2300~2400MHz	2300~2400MHz
LTE TDD B41	2555~2655 MHz	2555~2655 MHz

### 5.3 TX Power and RX Sensitivity

Table 5-3 RF power and RX sensitivity

Band	Transmitting Power	Receiving Sensitivity
GSM850	33 dBm+2/-2 dBm	<-108 dBm
EGSM900	33 dBm+2/-2 dBm	<-108 dBm
DCS1800	30 dBm+2/-2 dBm	<-108 dBm
PCS1900	30 dBm+2/-2 dBm	<-108 dBm
CDMA BC0	24dBm+1/-1dBm	<-107dBm
UMTS B1	24 dBm +1/-3 dBm	<-108 dBm
UMTS B2	24 dBm +1/-3 dBm	<-108 dBm
UMTS B4	24 dBm +1/-3 dBm	<-108 dBm
UMTS B5	24 dBm +1/-3 dBm	<-108 dBm
UMTS B8	24 dBm +1/-3 dBm	<-109 dBm
UMTS B9	24 dBm +1/-3 dBm	<-108 dBm
UMTS B19	24 dBm +1/-3 dBm	<-108 dBm
TD-SCDMA B34/B39	24 dBm +1/-3 dBm	<-109 dBm
LTE FDD B1 (10MHz)	23 dBm+2/-2 dBm	<-97 dBm
LTE FDD B2 (10MHz)	23 dBm+2/-2 dBm	<-95 dBm
LTE FDD B3 (10MHz)	23 dBm+2/-2 dBm	<-95 dBm
LTE FDD B4(10MHz)	23 dBm+2/-2 dBm	<-97 dBm
LTE FDD B5(10MHz)	23 dBm+2/-2 dBm	<-95 dBm

LTE FDD B7(10MHz)	23 dBm+2/-2 dBm	<-95 dBm
LTE FDD B8(10MHz)	23 dBm+2/-2 dBm	<-95 dBm
LTE FDD B9(10MHz)	23 dBm+2/-2 dBm	<-96 dBm
LTE FDD B17(10MHz)	23 dBm+2/-2 dBm	<-95 dBm
LTE FDD B20(10MHz)	23 dBm+2/-2 dBm	<-95 dBm
LTE FDD B28(10MHz)	23 dBm+2/-2 dBm	<-95dBm
LTE TDD B38(10MHz)	23 dBm+2/-2 dBm	<-97 dBm
LTE TDD B39(10MHz)	23 dBm+2/-2 dBm	<-97 dBm
LTE TDD B40(10MHz)	23 dBm+2/-2 dBm	<-97dBm
LTE TDD B41(10MHz)	23 dBm+2/-2 dBm	<-95 dBm

 NOTE

The above indicators are in the laboratory environment test data, LTE is under 10MHz bandwidth testing results, the actual will be due to the impact of the network environment will be a certain deviation.

## 5.4 ESD Protection

Table 5-4 ESD feature

Testing Point	Contact Discharge	Air Discharge
V_MAIN	±8KV	±15KV
GND	±8KV	±15KV
ANT	±8KV	±15KV
Cover	±8KV	±15KV
Others	±2KV	±4KV

 NOTE

When N720 Mini PCIe is in use, the ground of fixing hole of the board should be connected with the user equipment, to avoid damage to the module due to static electricity.

## 6 Mounting the Module onto the Application Board

N720 Mini PCIe is compatible with the PCI Express Mini Card 1.2 standard. You can mount it by plugging.

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## 7 Packaging and Storage

### 7.1 Packaging

N720 Mini PCIe modules are packaged in sealed bags on delivery to guarantee a long shelf life. Package the modules again in case of opened for any reasons.



Figure 7-1 N720 Mini PCIe tray package



Figure 7-2 Transport box

### 7.2 Storage Conditions

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