

# N58-LA

## Product Specifications

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**Notice**

This document provides a guide for users to use N58-LA.

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 the N58-LA series. It describes the N58-LA variants, supported frequency bands, basic characteristics, interface definitions, reliability indicators, appearance, dimensions, assembly, packaging, storage, and other information.

## Audience

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

## Change History

Issue	Date	Change	Author
1.0	2019-12	Initial draft.	ZhangGang
2.0	2020-03	Updated the frequency bands supported.	ZhangGang
2.1	2020-07	Updated the dimension drawing and PCB package drawing.	Liu Pengbin
2.2	2020-08	Updated certain data.	ZhangGang
2.3	2021-01	Updated the document structure and optimized the content.	Wu Hui

## Conventions

Symbol	Description
!	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.
i	Indicates instructions or tips. This symbol provides advices or suggestions that may be useful when using the module.

## Related Documents

*Neoway\_N58-LA\_Datasheet*

*Neoway\_N58-LA\_Hardware\_User\_Guide*

*Neoway\_N58-LA\_AT\_Command\_Manual*

*Neoway\_N58-LA\_EVK\_User\_Guide*

# 1 Safety Recommendations

Ensure that this product is used in compliance with the requirements of the country and environment. Read the following safety recommendations to avoid bodily injuries or damages of the product or workplace:

- Do not use this product at any places with a risk of fire or explosion.  
If this product is used in a place with flammable gas or dust, such as propane gas, gasoline, and flammable spray, it will cause an explosion or a fire.
- Disable the wireless communication function in places where wireless communication is prohibited.
- Do not use this product that can interfere with other electronic devices in environments, such as hospitals and airplanes.

Follow the requirements below during the application design and use of this product:

- Do not disassemble this product without permission from Neoway. Otherwise, we are entitled to refuse to provide further warranty.
- Design your application correctly based on the hardware user guide. Connect this product to a stable power supply and route traces following fire safety standards.
- Avoid touching the pins of this product to prevent damages caused by ESD.

## 2 About N58-LA

### 2.1 Product Introduction

N58-LA is an industrial LTE module that is developed based on the UNISOC platform. This module supports GSM/GPRS and LTE Cat 1 network modes, provides a variety of hardware interfaces, supports audio and video functions, and optionally supports GNSS. This module is easy for customers to develop applications and is applicable to IoT communication devices, including wireless meter reading terminals, in-vehicle terminals, handheld POS terminals, and industrial routers.

### 2.2 Product Overview

N58-LA series include multiple variants. The following table lists the variants and frequency bands supported.

Table 2-1 Variants and frequency bands

Variant	Region	Category	Frequency Band	GNSS <sup>1)</sup>	Codec
N58-LA	Latin America	Cat1	FDD-LTE: B2, B4, B5, B7, B66 TDD-LTE: B38, B40, B41 GSM/GPRS: 850/1900MHz	Supported	Yes

 GNSS<sup>1)</sup> indicates that the configuration is optional.

## 2.4 Basic Features

Table 2-2 Basic features of the N58-LA module

Feature	Description
Physical features	<ul style="list-style-type: none"> <li>Dimensions: (30.0±0.15)mm × (28.0±0.15)mm × (2.6±0.2)mm</li> <li>Package: LGA+LCC</li> <li>Weight: 4.63g</li> </ul>
Temperature range	<p>Operating temperature range: -30°C to +75°C</p> <p>Extended temperature range: -40°C to +85°C</p> <p>Storage temperature range: -40°C to +90°C</p>
Operating voltage	<p>VBAT: 3.4V to 4.2V, Typical value: 3.8V</p> <p>Sleep mode<sup>2)</sup>: &lt;2.6mA</p>
Current	<p>Idle mode<sup>3)</sup>: &lt;16mA</p> <p>Operating mode<sup>4)</sup> (LTE mode): &lt;600mA</p>
Application processor	ARM Cortex-A5 processor, 500MHz main frequency
Memory	<p>RAM: 128 Mb</p> <p>ROM: 64 Mb</p>
Frequency band	See Table 2-1.
Wireless rate	<p>GPRS: Max 85.6 kbps(DL)/Max 85.6 kbps(UL)</p> <p>FDD-LTE: Cat1, Max 10Mbps(DL)/Max 5Mbps (UL)</p> <p>TDD-LTE: Cat1, Max 8Mbps(DL)/Max 2Mbps(UL)</p>
Power class	<p>GSM850: +33dBm (Power Class 4)</p> <p>PCS1900: +30dBm (Power Class 1)</p> <p>LTE: +23dBm (Power Class 3)</p>
	2G/4G antenna, GNSS antenna, 50Ω characteristic impedance
	Two UART interfaces, at most 2 Mbps
	Two UIM interfaces, adaptive 1.8 V/2.85 V
Application interface	<p>One USB2.0 high-speed interface</p> <p>One 12-bit ADC interface, voltage detection range: 0.1 V to 1.7 V</p> <p>One SDIO interface</p> <p>One 1PPS interface</p> <p>One I2C interface, only the master mode supported</p>
Data	PPP, RNDIS, ECM
Protocol	TCP, UDP, MQTT, FTP/FTPS, HTTP/HTTPS, SSL, TLS
Certification	CCC, SRRC, RoHS, CE

## approval



Sleep mode<sup>2)</sup>: indicates that the module enters the low power consumption state. In this state, the peripheral interface of the module is disabled, but the radio frequency function is normal. The module will exit the sleep mode when there is an incoming call or an SMS message, and will re-enter the sleep mode when the incoming call and voice end.

Idle mode<sup>3)</sup>: indicates the status of the module when the module is functioning properly and there is no data service.

Operating mode<sup>4)</sup> current indicates the operating current of the module when there is data communication. In idle mode<sup>3)</sup>, only an example of the current in LTE mode is provided. For details about the current in non-LTE modes, see the N58-LA current test report.

## 3 Compliant Standards

N58-LA complies with the following standards:

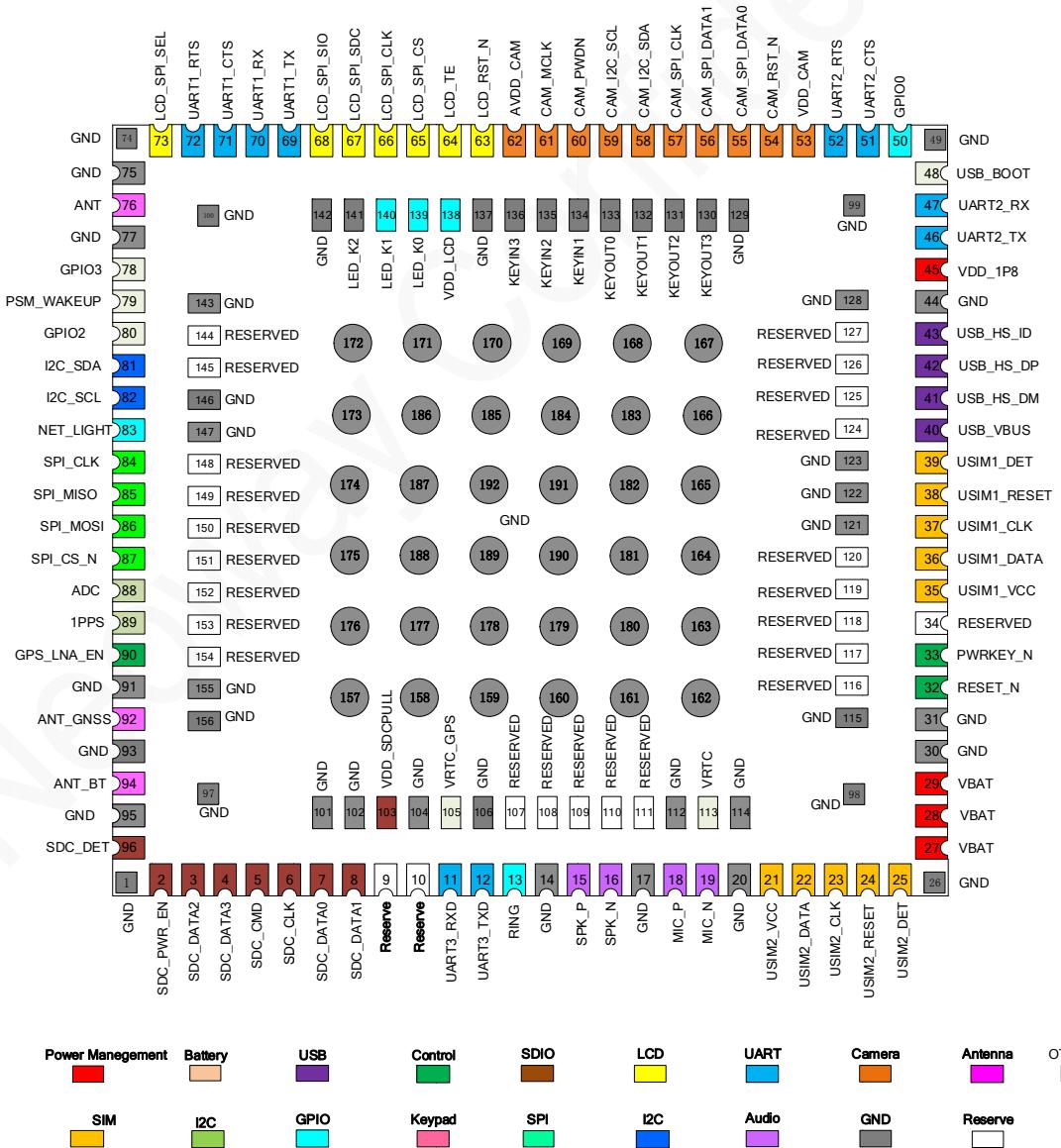
- 3GPP TS 07.07 AT command set for GSM Mobile Equipment (ME)
- YD 1214-2006 Technical requirement of 900/1800MHz TDMA Digital Cellular Mobile Telecommunication Network General Packet Radio Service (GPRS) Equipment: Mobile Stations
- YD 1215-2006 Testing Methods of 900/1800MHz TDMA Digital Cellular Mobile Telecommunication Network General Packet Radio Service (GPRS) Equipment: Mobile Stations
- YD 1032-2000 Limits and Measurement Methods of Electromagnetic Compatibility for 900/1800MHz Digital Cellular Telecommunications System Part1: Mobile Station and Ancillary Equipment
- YD/T 2220-2011 Technical Requirement and test method of WCDMA/GSM(GPRS) dual mode digit mobile user equipment (phase 4)
- 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
- 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
- CNCA-07C-031:2007 Rules for Compulsory Certification of Telecommunication Equipment Telecommunication Terminal Equipment
- GSM/GPRS/EDGE 2G Communication Protocol
- LTE Cat1 4G Communication Protocol

# 4 Module Pins

There are 192 pins on the N58-LA module, and pads use the LGA+LCC package. The N58-LA module supports the functional interfaces, including the power, USB, UIM, UART, ADC, I2C, and SDIO interfaces.

## 4.1 Pin Layout

Figure 4-1 Pin layout of the N58-LA module (top view)

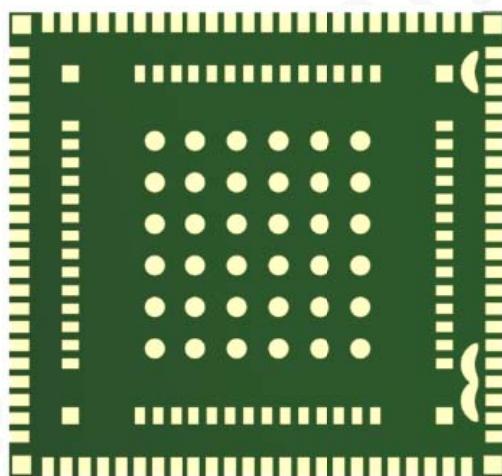


## 4.2 Module Appearance

Figure 4-2 Top view of the N58-LA module



Figure 4-3 Bottom view of the N58-LA module



These are renderings of the N58-LA module. For the actual appearance, see the module that you receive from Neoway.

# 5 Electrical Characteristics and Reliability

This chapter describes the electrical characteristics and reliability of the N58-LA module, including the input and output voltage and current of the power supply, the current consumption of the module in different states, the operating and storage temperature ranges, and the ESD protection characteristics.

## 5.1 Electrical Characteristics



- If the voltage is excessively low, the module might fail to start. If the voltage is excessively high 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 to the module, ensure that the output current is at least 2.5A. The 2.5A current occurs when the module is working at the maximum power level of the GSM mode. The peak current during burst transmission has a short duration. Placing a large capacitor on the VBAT pin of the module can effectively enhance the freewheeling capability of the power supply and prevent excessive voltage drops that cause exceptions, such as module shutdown.

Table 5-1 Electrical characteristics of the N58-LA module

Model Status	Minimum Value	Typical Value	Maximum Value
VBAT	V <sub>in</sub>	3.4V	4.2V
	I <sub>in</sub>	N/A	2.5A

Table 5-2 Current consumption of the N58-LA module(typical)

Frequency Band	Status	Sleep (mA)	Idle (DRX/eDRX) (mA)	Active(mA)@max power
FDD-LTE: B2, B4, B5, B7, B66		<2.6 mA	<16mA	<600mA
TDD-LTE:B38, B40, B41		<2.6mA	<16mA	<340mA
GSM850		<2.6mA	<15mA	<170mA
GSM1900		<2.6mA	<15mA	<170mA

## 5.2 Temperature Characteristics

Table 5-3 Temperature characteristics of the N58-LA module

Model Status	Minimum Value	Typical Value	Maximum Value
Operating temperature	-30°C	25°C	75°C
Extended temperature	-40°C	25°C	85°C
Storage temperature	-40°C	25°C	90°C



If the operating temperature of the module is in the range of a low temperature -30°C to -35°C or a high temperature 75°C to 85°C, the RF performance indicators of the module may deteriorate and fail to comply with 3GPP specifications. However, it will not have a large impact on the normal use of the module. After the temperature is restored, the RF performance indicators of the module can comply with 3GPP specifications.

## 5.3 ESD Protection Characteristics

Electronic products need to pass ESD tests. The following table shows the ESD capability of key pins of the module. It is recommended to add ESD protection based on the application industry of the product to ensure product quality when designing a product.

Test environment: humidity 45%; temperature 25°C

Table 5-4 ESD protection characteristics of the N58-LA module

Test Point	Contact Discharge	Air Discharge
GND	±8kV	±15kV
ANT	±8kV	±15kV
Shielding cover	±8kV	±15kV

# 6 RF Characteristics

The N58-LA module supports network modes, including GSM, FDD-LTE, TDD-LTE (Cat1), and optionally supports GNSS. This chapter describes the RF characteristics of the N58-LA module.

## 6.1 Operating Bands

Table 6-1 Operating bands of the N58-LA module

Operating Band	Uplink	Downlink
GSM850	824–849MHz	869–894MHz
PCS1900	1850–1910MHz	1930–1990MHz
FDD-LTE B2	1850–1910MHz	1930–1990MHz
FDD-LTE B4	1710–1755MHz	2110–2155MHz
FDD-LTE B5	824–849MHz	869–894MHz
FDD-LTE B7	2500–2570MHz	2620–2690MHz
FDD-LTE B66	1710–1780MHz	2110–2200MHz
TDD-LTE B38	2570–2620MHz	2570–2620MHz
TDD-LTE B40	2300–2400MHz	2300–2400MHz
TDD-LTE B41	2535–2655 MHz	2535–2655 MHz

## 6.2 TX Power and RX Sensitivity

Table 6-2 TX power and RX sensitivity of the N58-LA module

Frequency Band	TX Power	RX Sensitivity
GSM850	33d	Bm+2/-2dBm
PCS1900	30d	Bm+2/-2dBm
FDD-LTEB2	23d	Bm+2/-2dBm
FDD-LTEB4	23d	Bm+2/-2dBm
FDD-LTEB5	23d	Bm+2/-2dBm
FDD-LTEB7	23d	Bm+2/-2dBm
FDD-LTEB66	23d	Bm+2/-2dBm
TDD-LTE B38	23d	Bm+2/-2dBm
TDD-LTEB40	23d	Bm+2/-2dBm
TDD-LTEB41	23d	Bm+2/-2dBm



All values above were obtained in labs. The LTE frequency band indicators are tested under the conditions of 10MHz bandwidth, QPSK modulation, and 50 RBs. The RX sensitivity of certain frequency bands on the live network may have a certain deviation due to interference.

## 6.3 GNSS Parameters

Table 6-3 GNSS parameters

Parameter	Description
GPS L1 operating frequency	1575.42±1.023MHz
GLONASS operating frequency	1597.5–1605.9MHz
BDS operating frequency	1559.1–1563.1MHz
Tracking sensitivity	-160dBm
Acquisition sensitivity	-154dBm
Positioning precision (in an open environment)	<3m (CEP50)
Hot start time (in an open environment)	<1s
Cold start time (in an open environment)	<33s
Update frequency	<10Hz
Noise coefficient(CNRin/CNRout)	3dB
GNSS data type	NMEA-0183
GNSS antenna type	Passive/active antenna



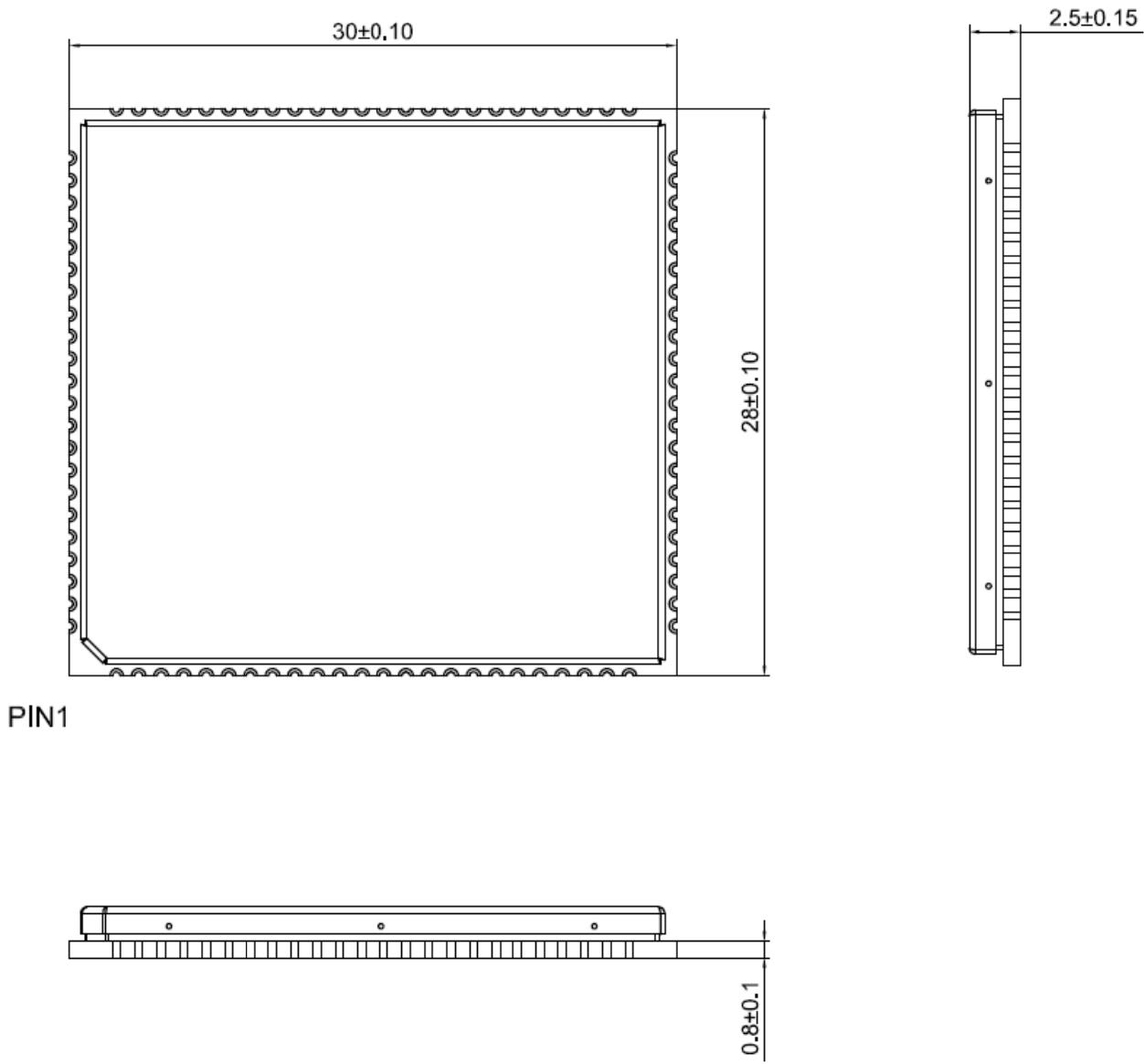
The tracking sensitivity and the acquisition sensitivity were obtained in a signaling test on SPIRENT6300, and they are the maximum values in multiple tests on samples. During the tests, no external LNA or active antenna was used to amplify the signals.

# 7 Mechanical Characteristics

This chapter describes the mechanical characteristics of the N58-LA module.

## 7.1 Dimensions

Figure 7-1 N58-LAtop and side dimensions (unit: mm)



## 7.2 Label

The label uses laser engraving and can withstand a high temperature up to 260°C.



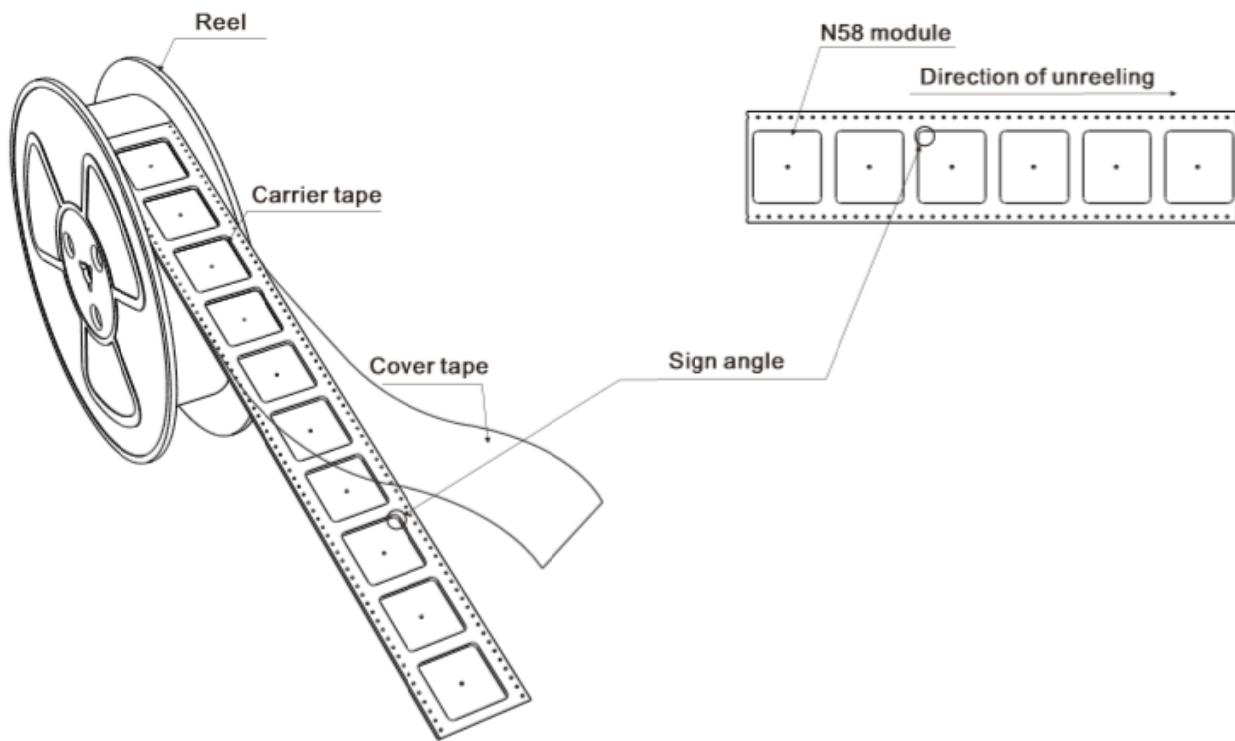
- The picture above is only for reference.
- The material and surface finishing must comply with RoHS directives.

## 7.3 Packaging

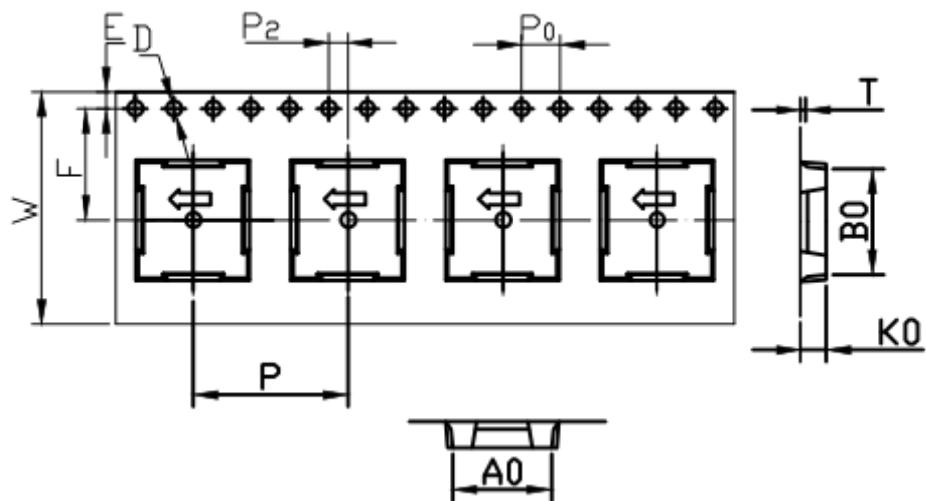
The N58-LA module uses a surface-mount method for furnace welding. A moisture-proof packaging method is used to prevent the product from being moist from production to customer use. That is, a processing method, such as using the aluminum foil bag, desiccant, humidity indicator card, tape, or vacuum, is used to ensure the dryness of the product and prolong the lifetime.

### 7.3.1 Reel and Tape

N58-LA modules in mass production are delivered in the following packaging.

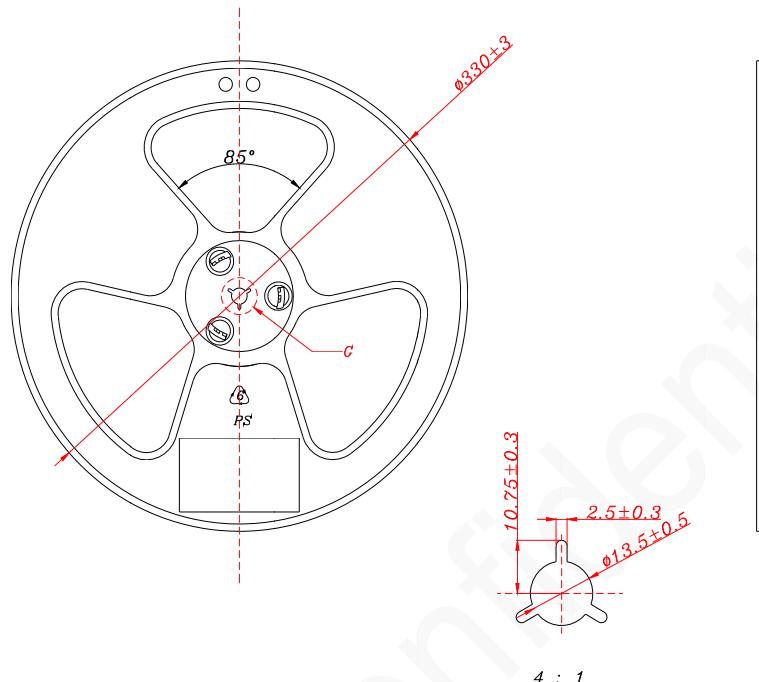


### Tape details



ITEM	W	$A_0$	$B_0$	$K_0$	$K_1$	P	F	E	D	$D_1$	$P_0$	$P_2$
DIM	$24.0^{+0.30}_{-0.10}$	$10.1^{+0.10}_{-0.10}$	$11.0^{+0.10}_{-0.10}$	$2.7^{+0.10}_{-0.10}$	$0.00^{+0.10}_{-0.10}$	$16.0^{+0.10}_{-0.10}$	$11.5^{+0.10}_{-0.10}$	$1.75^{+0.10}_{-0.10}$	$1.50^{+0.10}_{-0.00}$	$0.00^{+0.25}_{-0.00}$	$4.00^{+0.10}_{-0.10}$	$2.00^{+0.10}_{-0.10}$

## Reel details



### 7.3.2 Moisture

N58-LA is a level-3 moisture sensitive device, in compliance with standard IPC/JEDECJ-STD-020. Pay attention to all the related requirements for using this kind of components.

After the module is unpacked, if it is exposed to the air for a long time, the module will be moist, and the module may be damaged during reflow soldering or welding in a lab. It is recommended that the module exposed to the air for a long time must be baked before it can be used again. The baking conditions are determined based on the moisture condition. It is recommended to bake the module at a temperature higher than 90 degrees for more than 12 hours. In addition, since the carrier tape is of non-high temperature resistant material, the module cannot be baked directly on the carrier tape.

## 8 Assembly

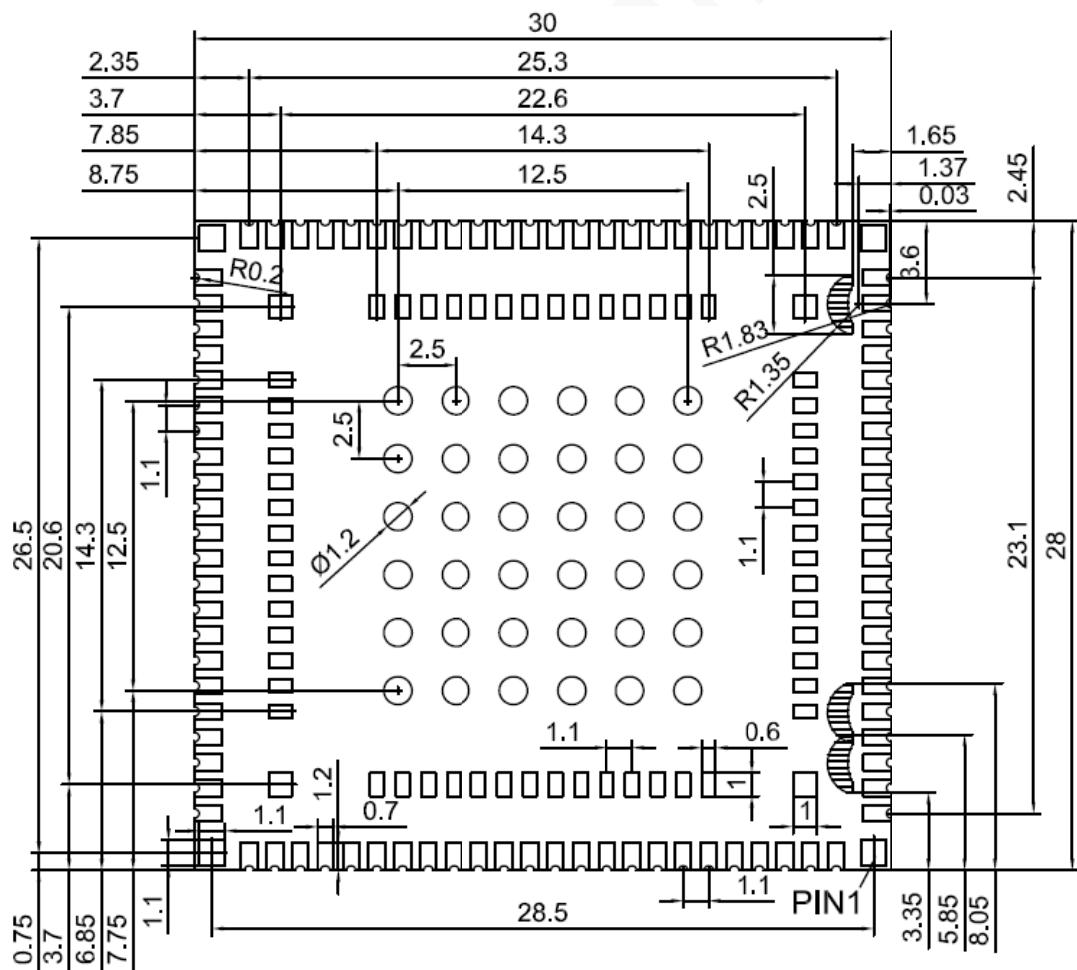
This chapter describes the N58-LA module package, the recommended application package, and technical points related to SMT.

## 8.1 Module PCB Package



Do not route traces, dig holes, or lay copper in the area under the module. Otherwise, print green ink or white ink on the surface.

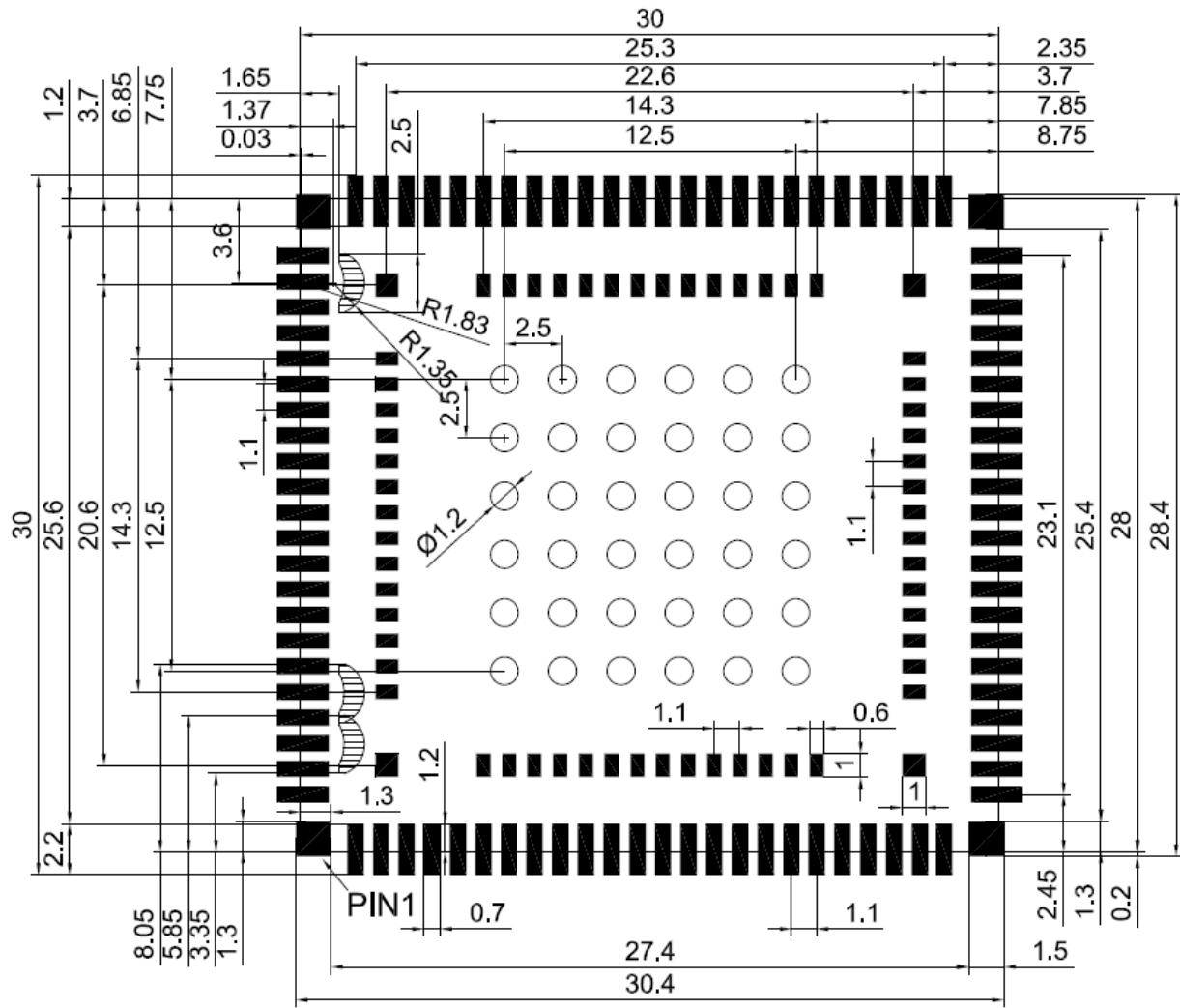
Figure 8-1 Bottom view of the N58-LA module PCB(unit:mm)



## 8.2 Application PCB Package

The pins of N58-LA use the 100-PIN LGA+92-PIN LCC package. The recommended PCB package is as follows, and the unit is mm.

Figure 8-2 Top view of the recommended N58-LA PCB package



## 8.3 Stencil

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

## 8.4 Solder Paste

The solder paste volume and the PCB flatness play key roles in the production yield.

Do not use solder pastes with lead that use a module technique that is different from Neoway module technique.

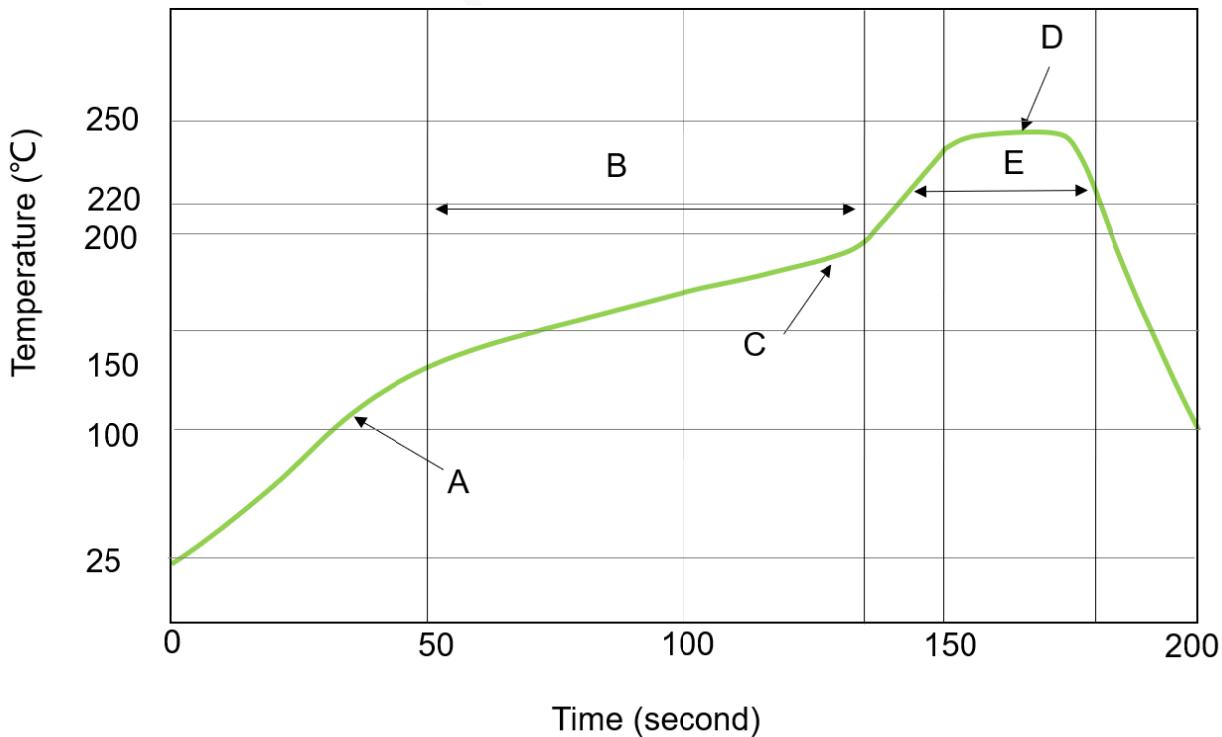
- The melting temperature of solder pastes with lead is 35°C lower than that of solder pastes without lead. The temperature in the reflow process parameters is also lower than that of solder pastes without lead, and less time is consumed correspondingly. It is easy to cause the LCC/LGA in the module to be in the semi-melted state after the second reflow soldering, resulting in poor soldering.
- If customers must use solder pastes with lead, ensure that the reflow temperature is kept at 220°C for more than 45 seconds and the peak temperature reaches 240°C.

## 8.5 SMT Furnace Temperature Curve



Neoway will not provide a warranty for thermal component exceptions caused by improper temperature control.

Figure 8-3 SMT furnace temperature curve



Technical parameters:

- Ramp-up rate: 1°C/sec to 4°C/sec
- Ramp-down rate: -3°C/sec 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 important notes in N58-LA storage and mounting, refer to *Neoway Module Reflow Manufacturing Recommendations*.

When manually desoldering the module, 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 melt. Then gently remove the module using tweezers. Do not shake the module in high temperatures while removing it. Otherwise, the components inside the module might get misplaced and cannot be repaired.

# A Abbreviations

Abbreviation	Full Name
ADC	Analog-to-Digital Converter
AFC	Automatic Frequency Control
AGC	Automatic Gain Control
AI	Analog Input
AO	Analog Output
AP	Access Point
ARM	Advanced RISC Machine
BDS	BeiDou Navigation Satellite System
BOM	Bill of Material
BT	Bluetooth
CCC	China Compulsory Certification
CEP	Circular Error Probable
CNR	Carrier to Noise Rate
CPU	Central Processing Unit
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
FCC	Federal Communications Commission
FDD	Frequency Division Duplexing
FPC	Flexible Printed Circuit
FTP	File Transfer Protocol
FTPS	FTP Secure
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
MCU	Microcontroller Unit
MIPI	Mobile Industry Processor Interface
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
SIM	Subscriber Identification Module
SPI	Serial Peripheral Interface
SRAM	Static Random Access Memory
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
WLAN	Wireless Local Area Network

#### FCC Compliance Notice

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

## **Regulatory Module Integration Instructions**

### **2.2 List of applicable FCC rules**

This device complies with part2-Subpart J ,part 22-Subpart H,part 24-Subpart E,part 27 of the FCC Rules.

### **2.3 Summarize the specific operational use conditions**

The input voltage to the module should be nominally 3.4-4.2V DC , typical value 3.8V DC and the ambient temperature of the module should not exceed 85°C.

If the antenna needs to be changed, the certification should be re-applied.

### **2.4 Limited module procedures**

Not applicable

### **2.5 Trace antenna designs**

Not applicable

### **2.6 RF exposure considerations**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment .This equipment should be installed and operated with minimum distance 20cm between the radiator& your body. If the device built into a host as a portable usage, the additional RF exposure evaluation may be required as specified by 2.1093.

### **2.7 Antennas**

Comply with the antenna requirements of Section 15.203 and 15.204(c), the requirements of antenna connector and spurious emission have been fulfilled, the maximum gain of GSM850/LTE Band 5 is 2.41dBi,PCS1900/LTE Band 2 is 4dBi, LTE Band 4/66 is 6 dBi.LTE Band7/38/41 is 9dBi,LTE Band40 is 0dBi.

### **2.8 Label and compliance information**

The outside of final products that contains this module device must display a label referring to the enclosed module. This exterior label can use wording such as: "Contains Transmitter Module FCC ID: PJ7-N58-LA ", or "Contains FCC ID: PJ7-N58-LA ", Any similar wording that expresses the same meaning may be used.

### **2.9 Information on test modes and additional testing requirements**

a)The modular transmitter has been fully tested by the module grantee on the required number of channels, modulation types, and modes, it should not be necessary for the host installer to re-test all the available transmitter modes or settings. It is recommended that the host product manufacturer, installing the modular transmitter, perform some investigative measurements to confirm that the resulting composite system does not exceed the spurious emissions

limits or band edge limits (e.g., where a different antenna may be causing additional emissions).

b) The testing should check for emissions that may occur due to the intermixing of emissions with the other transmitters, digital circuitry, or due to physical properties of the host product (enclosure). This investigation is especially important when integrating multiple modular transmitters where the certification is based on testing each of them in a stand-alone configuration. It is important to note that host product manufacturers should not assume that because the modular transmitter is certified that they do not have any responsibility for final product compliance.

C) If the investigation indicates a compliance concern the host product manufacturer is obligated to mitigate the issue. Host products using a modular transmitter are subject to all the applicable individual technical rules as well as to the general conditions of operation in Sections 15.5, 15.15, and 15.29 to not cause interference. The operator of the host product will be obligated to stop operating the device until the interference has been corrected

## **2.10 Additional testing, Part 15 subpart B disclaimer**

The final host / module combination need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device .

The host integrator installing this module into their product must ensure that the final composite product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operation and should refer to guidance in KDB 996369.

### **Frequency spectrum to be investigated**

For host products with certified modular transmitter, the frequency range of investigation of the composite system is specified by rule in Sections 15.33(a)(1) through (a)(3), or the range applicable to the digital device, as shown in Section 15.33(b)(1), whichever is the higher frequency range of investigation.

### **Operating the host product**

When testing the host product, all the transmitters must be operating. The transmitters can be enabled by using publicly-available drivers and turned on, so the transmitters are active. In certain conditions it might be appropriate to use a technology-specific call box (test set) where accessory devices or drivers are not available.

When testing for emissions from the unintentional radiator, the transmitter shall be placed in the receive mode or idle mode, if possible. If receive mode only is not possible then, the radio shall be passive (preferred) and/or active scanning. In these cases, this would need to enable activity on the communication BUS (i.e., PCIe, SDIO, USB) to ensure the unintentional radiator circuitry is enabled. Testing laboratories may need to add attenuation or filters depending on the signal strength of any active beacons (if applicable) from the enabled radio(s). See ANSI C63.4, ANSI C63.10 and ANSI C63.26 for further general testing details.