N58

Product Specifications

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Notice

This document provides a guide for users to use N58.

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

THIS GUIDE PROVIDES INSTRUCTIONS FOR CUSTOMERS TO DESIGN THEIR APPLICATIONS. PLEASE FOLLOW THE RULES AND PARAMETERS IN THIS GUIDE TO DESIGN AND COMMISSION. NEOWAY WILL NOT TAKE ANY RESPONSIBILITY OF BODILY HURT OR ASSET LOSS CAUSED BY IMPROPER OPERATIONS.

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About This Document

Scope

This document is applicable to the N58 series.

Audience

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

Change History

Issue	Date	Change	Changed By
1.0	2019-12	Initial draft	Zhang Gang
2.0	2020-03	• Added the EA variant • Updated the label	Zhang Gang

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_N58_Datasheet

Neoway_N58_Product_Specifications

Neoway_N58_AT_Command_Mannual

Neoway_N58_EVK_User_Guide

1 About N58

N58 is an industrial 4G module that is developed on Spectrum chipset. Its dimensions are 30 x 28 mm x 2.6 mm. This high-performance data transmission module supports GSM, FDD-LTE, TDD-LTE (Cat 1) network modes, provides various hardware interfaces, supports audio and video functions and BT connectivity, and optionally supports GNSS. This module is easy for customers to develop applications and is applicable to AMR, in-vehicle terminals, POS, industrial routers, etc.

1.1 Product Overview

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

Table 1-1 Variant and frequency bands

Region	Variant	Category	Band	GNSS	CODEC
China	CA	Cat1	FDD-LTE: B1, B3, B5, B8, TDD-LTE: B34, B39, B40, B41 GSM/GPRS: 900/1800 MHz	Optional	Yes
Europe, Middle East Asia, Africa	EA	Cat1	FDD-LTE: B1, B3, B5, B7, B8, B20, B28 TDD-LTE: B38, B40, B41 GSM/GPRS: 900/1800MHz	Optional	Yes
Latin America	LA*	Cat1	FDD-LTE: B1, B2, B3, B5, B7, B8, B28, B66 TDD-LTE: B38, B40, B41 GSM/GPRS: 850/900/1800/1900 MHz	Optional	Yes

1.2 Block Diagram

N58 consists of the following functionality units:

- Baseband

- 26MHz crystal

- Power management unit

- RF section

- Flash

- Digital interfaces (USIM, I2C, API, KEYPAD, UART, USB, SDIO, etc.)

- Analog interfaces (ADC, AUDIO)

Figure 1-1 Block Diagram
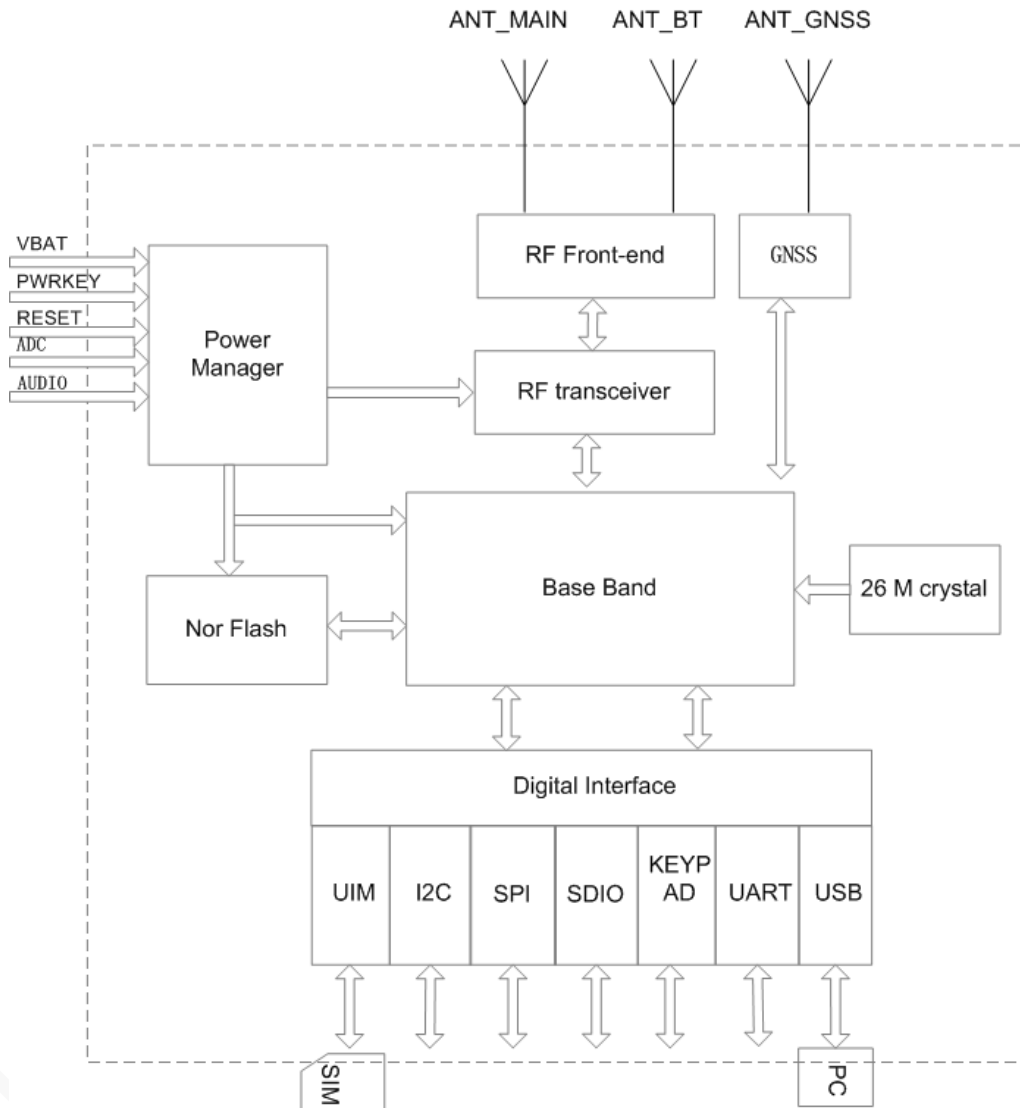
1.3 Basic Features

Parameter	Description
Physical features	- Dimensions: (30.0±0.15) mm × (28.0±0.15) mm × (2.6±0.2) mm - Package: LGA + LCC - Weight: 4.63g

Temperature ranges	Operating: -30°C to +75°C Extended: -35°C to +85°C Storage: -40°C to +90°C
Operating voltage	VBAT: 3.4V to 4.2V, TYP: 3.8V
Current	Sleep: < TBD Idle: < TBD Operating current: TBD
MIPS processor	ARM Cortex- A5 processors, 500MHz main frequency, 32 kB L1 cache
Memory	RAM: 128Mb ROM: 64Mb
Band	See Table 1-1.
Wireless rate	GPRS: Max 85.6 Kbit/s(DL) / Max 85.6 Kbit/s(UL) FDD-LTE: Cat1, Max 10 Mbps(DL)/Max 5Mbps(UL) TDD-LTE: Cat1, Max 8.96Mbps(DL)/Max 2Mbps(UL)
Transmit power	GSM850: +33dBm (Power Class 4) EGSM900: +33dBm (Power Class 4) DCS1800: +30dBm (Power Class 1) PCS1900: +30dBm (Power Class 1) LTE: +23dBm (Power Class 3)
Application Interfaces	2G/4G antenna, GNSS antenna, BT RX antenna, 50Ω characteristic impedance
	Two UART interfaces, at most 2 Mbit/s
	Two USIM interfaces, 1.8V/3V adaptive
	One USB2.0 high-speed interface
	One 12-bit ADC interface, detectable voltage ranging from 0.1 to 1.7V.
	One SDIO interface, used for SD card
	One 1PPS interface
	One I2C interface, host mode only
AT commands	3GPP Release 13 Neoway extended commands
SMS	PDU, TXT
Data	PPP, RNDIS, ECM
Protocol	TCP, UDP, MQTT, FTP/FTPS, HTTP/HTTP(S), SSL, TLS
Certification approval	CCC, SRRC, RoSH, CE

* indicates functions that will be supported in the future.

2 Compliant Standards

N58 complies with the following standards:

- 3GPP TS 07.07AT 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-O7C-031:2007 Rules for Compulsory Certification of Telecommunication Equipment Telecommunication Terminal Equipment

- 3GPP TS GSM Specification Set

- CDMA2000@1x,1xAdvanced,1xEV-DOrA Specification Set

- 3GPP TS LTE Cat1 4G Specification Set

3 Module Pins

There are 192 pins on N58 and their pads are introduced in LGA + LCC package.

3.1 Pad Layout

Figure 3-1 shows the pad layout of N58.

Figure 3-1 N58 pin definition
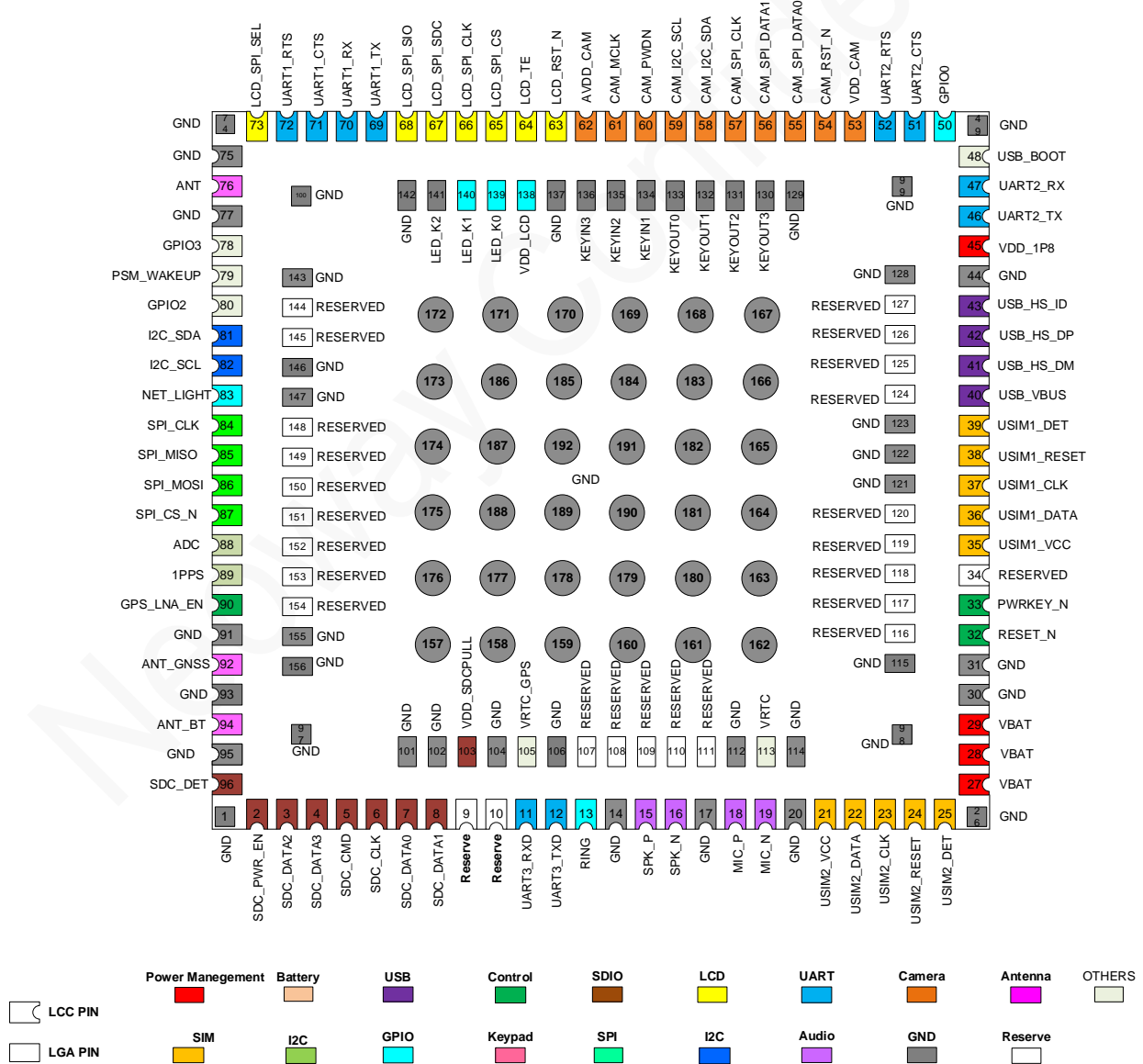
3.2 Module Appearance

Figure 3-1 Top view if N58

Figure 3-2 Bottom view of N58
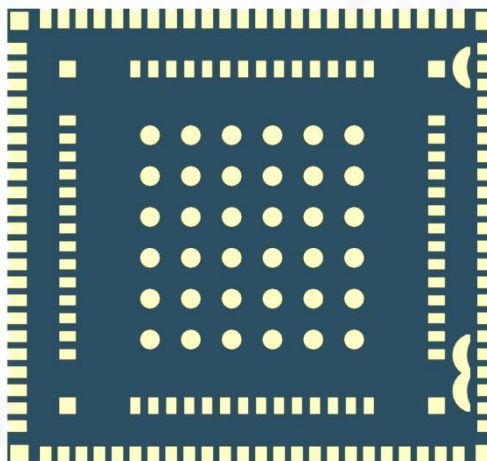
4 Electric Feature and Reliability

This chapter describes the electric features and reliability of N58, including the current and voltage of each power pin, operating and storage temperature ranges, and ESD protection features.

4.1 Electric Features

Table 4-1 Operating conditions of N58

Pin	Parameter	Minimum Value	Typical Value	Maximum Value
VBAT	V_{in}	3.4V	3.8V	4.2V
	I_{in}	/	/	2.5A

⚠️ If the voltage is lower than the threshold, the module might fail to start. If the voltage is higher than the 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 4-2 Current consumption of N58 (Typical)

Frequency Band Status	PSM/Sleep (mA)	Idle (DRX/eDRX) (mA)	Active (mA) @max power
FDD-LTE: B1, B2, B3, B4, B5, B7, B8, B20, B28, B66	TBD	TBD	TBD
TDD-LTE: B34, B38, B39, B40, B41	x	x	x
GSM 900/850	x	x	x
GSM1800/1900	x	x	x

4.2 Temperature Features

Table 4-3 Temperature feature of N58

Status	Minimum Value	Typical Value	Maximum Value
Operating	-30°C	25°C	75°C

Extended	-35°C	85°C
Storage	-40°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.

4.3 ESD Protection

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

Humidity 45%   Temperature 25°C

Table 4-4 N58 ESD protection

Testing Point	Contact Discharge	Air Discharge
VBAT	±8kV	±15kV
GND	±8kV	±15kV
ANT	±8kV	±15kV
Cover	±8kV	±15kV
Others	±2kV	±4kV

5 RF Features

N58 supports network modes including GSM, FDD-LTE, TDD-LTE (Cat 1), supports wireless connectivities of WLAN and BT, and optionally supports GNSS. This chapter describes the RF features of N58.

5.1 Operating Bands

Table 5-1 Operating bands of N58

Operating Bands	Uplink	Downlink
GSM850	824~849MHz	869~894MHz
EGSM900	880~915MHz	925~960MHz
DCS1800	1710~1785MHz	1805~1880MHz
PCS1900	1850~1910MHz	1930~1990MHz
FDD-LTE B1	1920~1980MHz	2110~2170MHz
FDD-LTE B2	1850~1910MHz	1930~1990MHz
FDD-LTE B3	1710~1785MHz	1805~1880MHz
FDD-LTE B4	1710~1755MHz	2110~2155MHz
FDD-LTE B5	824~849MHz	869~894MHz
FDD-LTE B7	2500~2570MHz	2620~2690MHz
FDD-LTE B8	880~915MHz	925~960MHz
FDD-LTE B20	832~862MHz	791~821MHz
FDD-LTE B28	703~748MHz	758~803MHz
FDD-LTE B66	1710~1780MHz	2110~2200MHz
TDD-LTE B34	2010-2025MHz	2010-2025MHz
TDD-LTE B38	2570~2620MHz	2570~2620MHz
TDD-LTE B39	1880~1920MHz	1880~1920MHz
TDD-LTE B40	2300~2400MHz	2300~2400MHz
TDD-LTE B41	2555~2655 MHz	2555~2655 MHz

5.2 TX Power and RX Sensitivity

Table 5-2 RF transmit power and RX sensitivity of N58

Band	TX Power	RX Sensitivity
GSM850	33dBm+2/-2dBm	≤-108dBm
EGSM900	33dBm+2/-2dBm	≤-108dBm
DCS1800	30dBm+2/-2dBm	≤-108dBm
PCS1900	30dBm+2/-2dBm	≤-108dBm
FDD-LTE B1	23dBm+2/-2dBm	≤-96dBm
FDD-LTE B2	23dBm+2/-2dBm	<-96dBm
FDD-LTE B3	23dBm+2/-2dBm	≤-96dBm
FDD-LTE B4	23dBm+2/-2dBm	<-96dBm
FDD-LTE B5	23dBm+2/-2dBm	≤-96dBm
FDD-LTE B7	23dBm+2/-2dBm	≤-95dBm
FDD-LTE B8	23dBm+2/-2dBm	≤-96dBm
FDD-LTE B20	23dBm+2/-2dBm	≤-96dBm
FDD-LTE B28	23dBm+2/-2dBm	≤-96dBm
FDD-LTE B66	23dBm+2/-2dBm	<-96dBm
TDD-LTE B34	23dBm+2/-2dBm	<-96dBm
TDD-LTE B38	23dBm+2/-2dBm	≤-96dBm
TDD-LTE B39	23dBm+2/-2dBm	≤-96dBm
TDD-LTE B40	23dBm+2/-2dBm	≤-96dBm
TDD-LTE B41	23dBm+2/-2dBm	≤-96dBm

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

5.3 GNSS Features

Table 5-3 GNSS Feature

Changes	Parameter
GPS L1 operating frequency	1575.42±1.023MHz
GLONASS operating frequency	1597.5~1605.9 MHz
BDS operation frequency	1559.1~1563.1 MHz
Tracking sensitivity	-161 dBm
Acquisition sensitivity	-147 dBm
Positioning precision (in air)	< 3m (CEP50)
Hot start (in air)	<2.0 s
Cold start (in air)	<35s
Update frequency	<10 Hz
CNRin/CNRout	3 dB
Max. positioning altitude	TBD
Max. positioning speed	TBD
Max. positioning acceleration	TBD
GNSS data type	NMEA-0183
GNSS antenna type	Passive/active antenna

The tracking sensitivity and the acquisition sensitivity were obtained in the signaling test on Spirent6300. During the test, no external LNA or active antenna was used to amplify the signals.

5.4 WLAN/BT Features

Table 5-4 WLAN/BT TX power and RX sensitivity

Operating Bands	Rate	Transmit power	Receiving Sensitivity
802.11b (2.4G)	1/2/5.5/11Mbps	TBD	TBD
802.11g (2.4G)	6/9/12/18/24/36Mbps	TBD	TBD
	48/54Mbps	TBD	TBD
802.11n (2.4G, 20MHz)	MCS0~MCS4	TBD	TBD

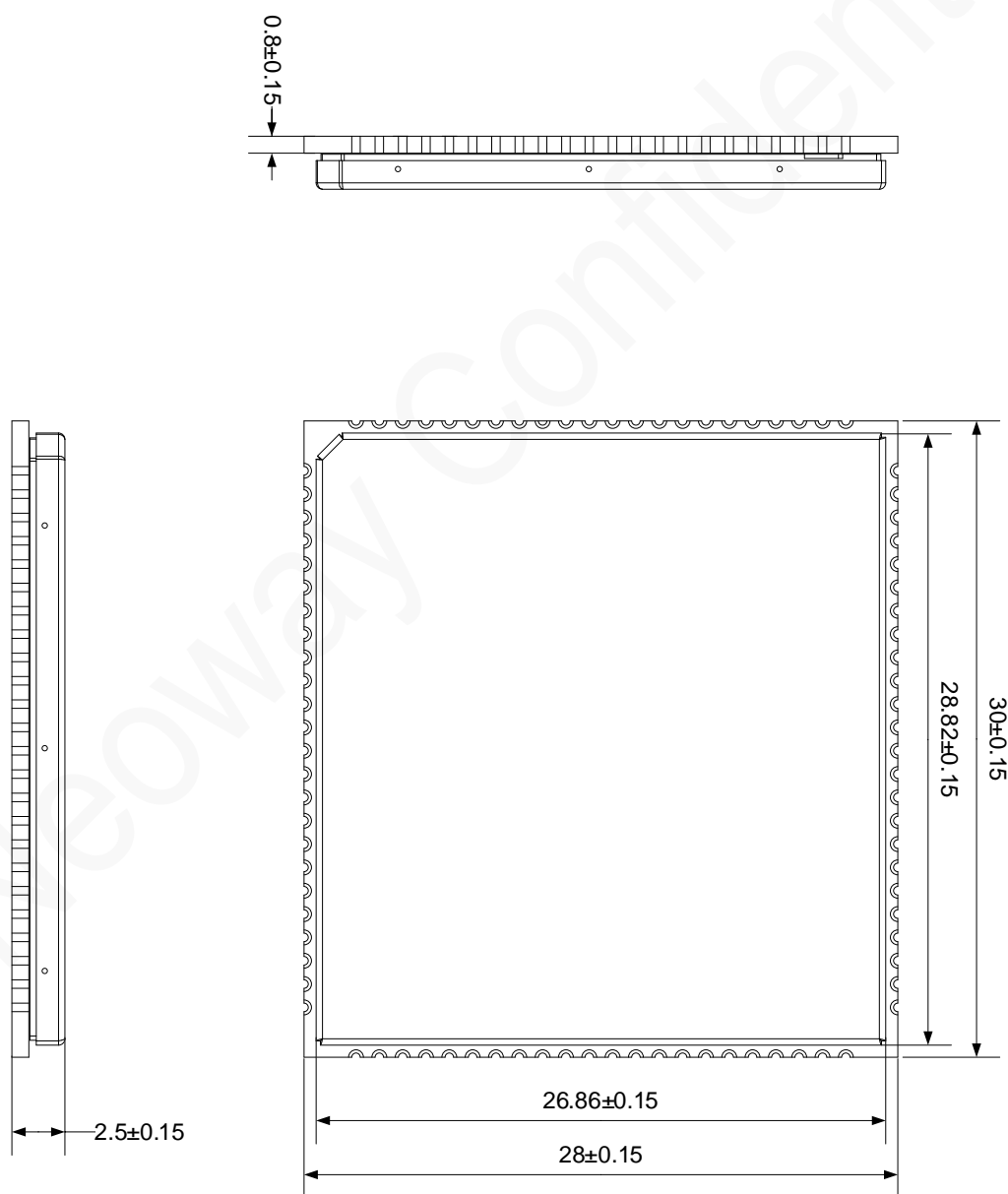|	MCS5~MCS7	TBD	TBD
	GFSK	TBD	TBD
Bluetooth	π/4-DQPSK	TBD	TBD
	8-DPSK	TBD	TBD
	LE	TBD	TBD

6 Mechanical Features

This chapter describes the mechanical features of N58.

6.1 Dimensions

Figure 6-1 N58 dimensions (Unit: mm)

6.2 Label

The label is carved on the cover. The following figure shows the label of N58.

Figure 6-2 N58 label

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

6.3 Packing

N58 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.

6.3.1 Reel

N58 in mass production is delivered in the following packaging.
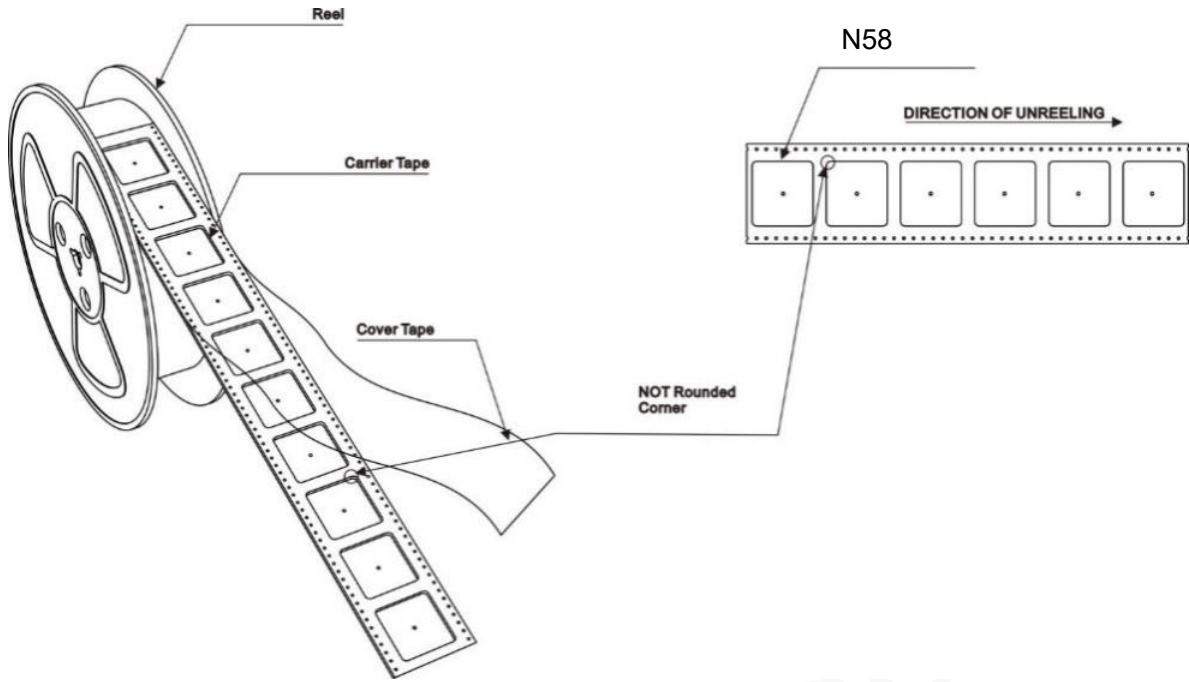
Tape dimensions
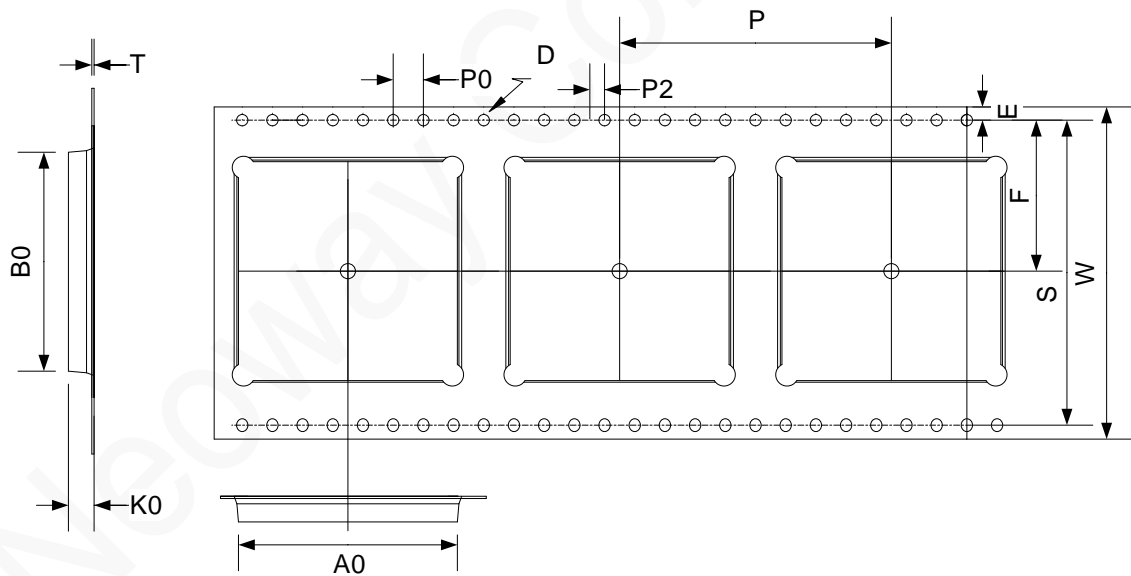
ITEM	W	A0	B0	S	D	E	F	K0	P0	P2	P	T
DIM	44.0	28.7	28.70	40.4	1.5	1.75	20.2	3.55	4.0	2.0	36.0	0.30
TOLE	+0.3 -0.3	+0.1 -0.1	+0.1 -0.1	+0.1 -0.0	+0.1 -0.0	±0.1	±0.10	+0.1 -0.1	±0.1	±0.1	±0.1	±0.05

Reel dimensions
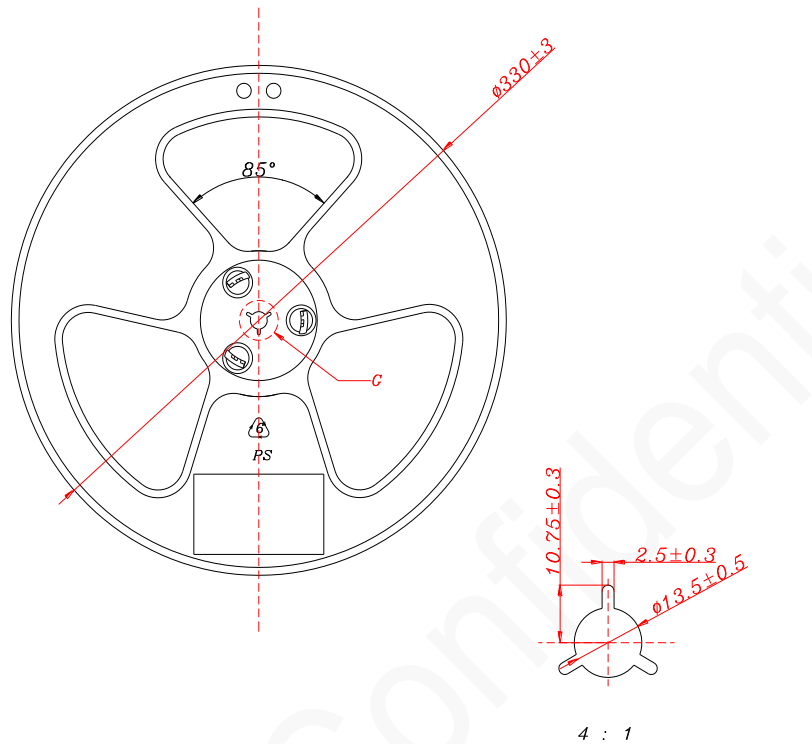
6.3.2 Moisture

N58 is a level 3 moisture-sensitive electronic elements, in compliance with IPC/JEDECJ-STD-020 standard.

If the module is exposed to air for more than 48 hours at conditions not worse than 30°C/60% RH, bake it at a temperature higher than 90 degrees for more than 12 hours 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.

7 Mounting N58 Onto Application PCB

This chapter describes the package of N58, the recommended footprint of the application PCB, and SMT specifications.

7.1 Bottom Dimensions

Figure 7-1 Bottom dimensions of N58 (Unit: mm)
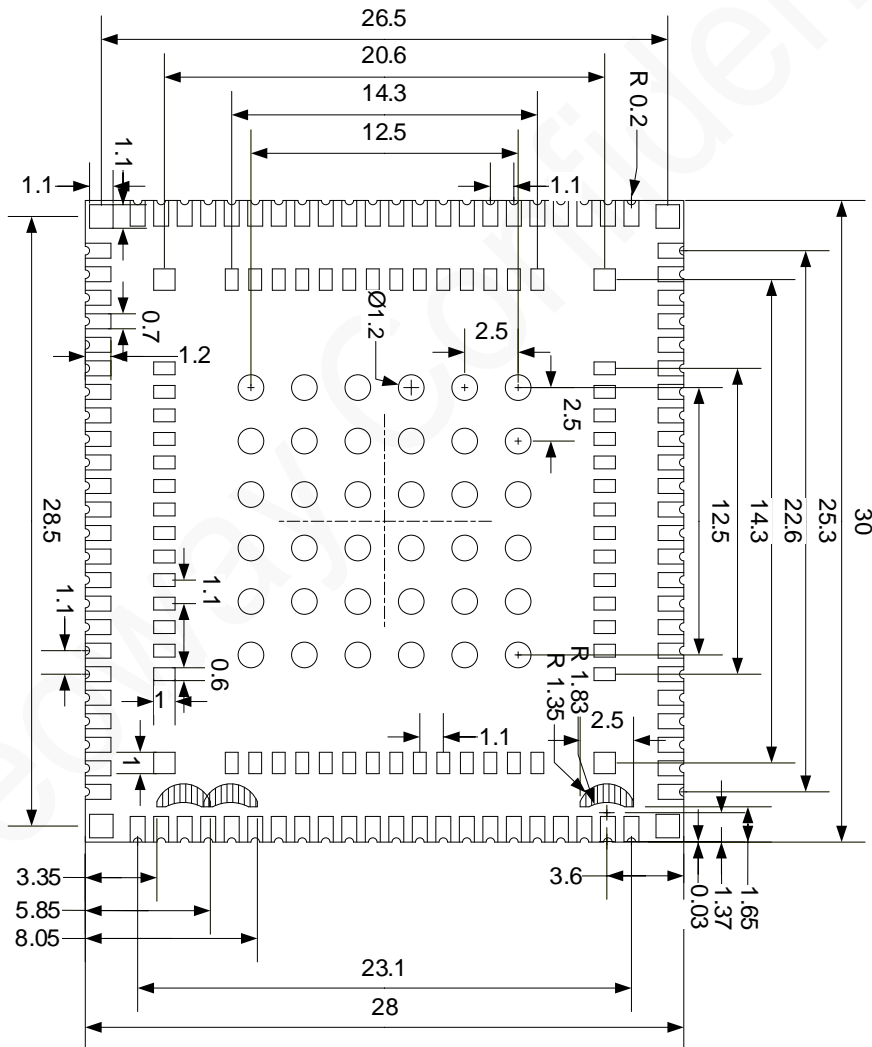
> ⚠ Do NOT route traces, dig holes, or lay copper under keepout area. Otherwise, print green ink or white ink on the surface.

7.2 Application Foot Print

Figure 7-2 Recommended footprint of N58 application PCB (Unit: mm)

7.3 Stencil
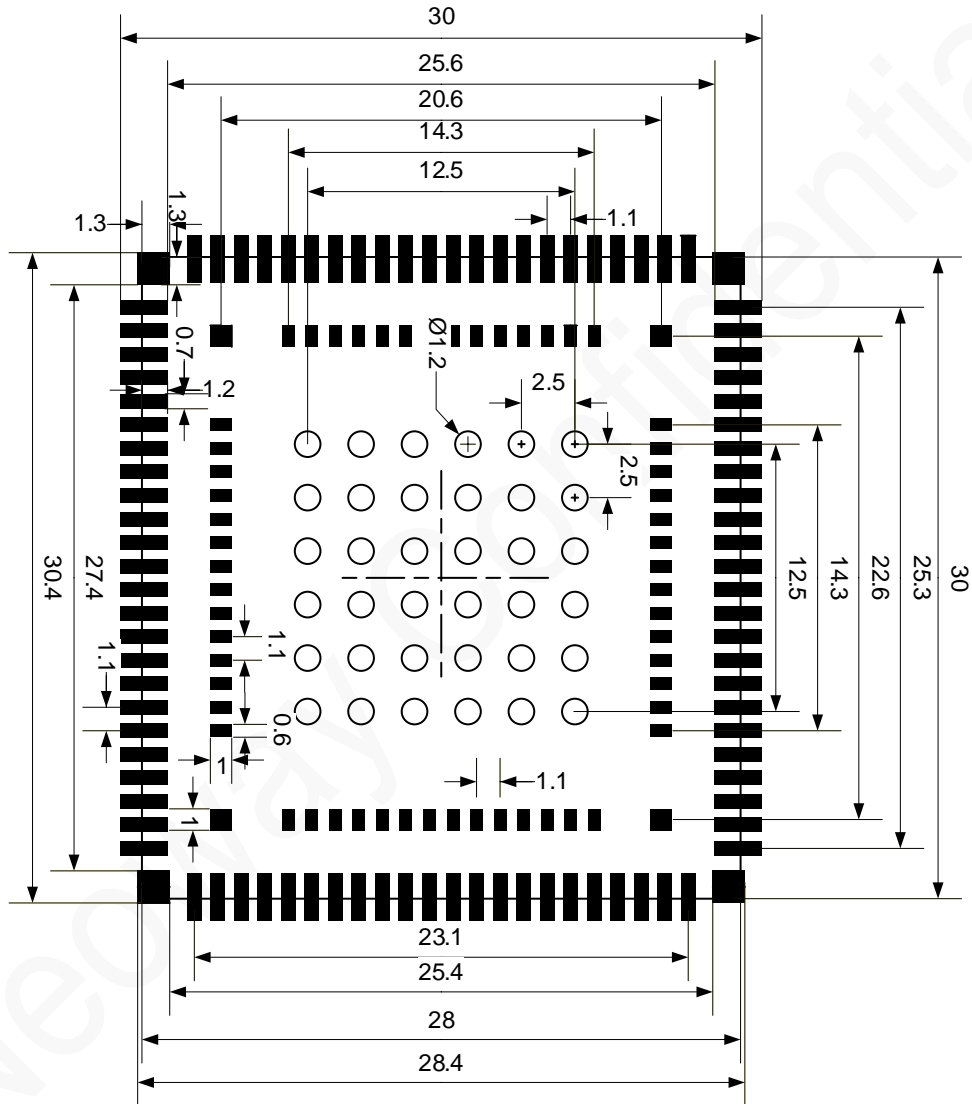
The recommended stencil thickness is at least 0.12 mm to 0.15 mm.

7.4 Solder Paste

The quality of the solder joint depends on the solder paste volume and the PCB flatness.

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 voiding for LGA and LCC inside the module after the 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.

7.5 SMT Furnace Temperature Curve

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 7-3 SMT furnace temperature curve
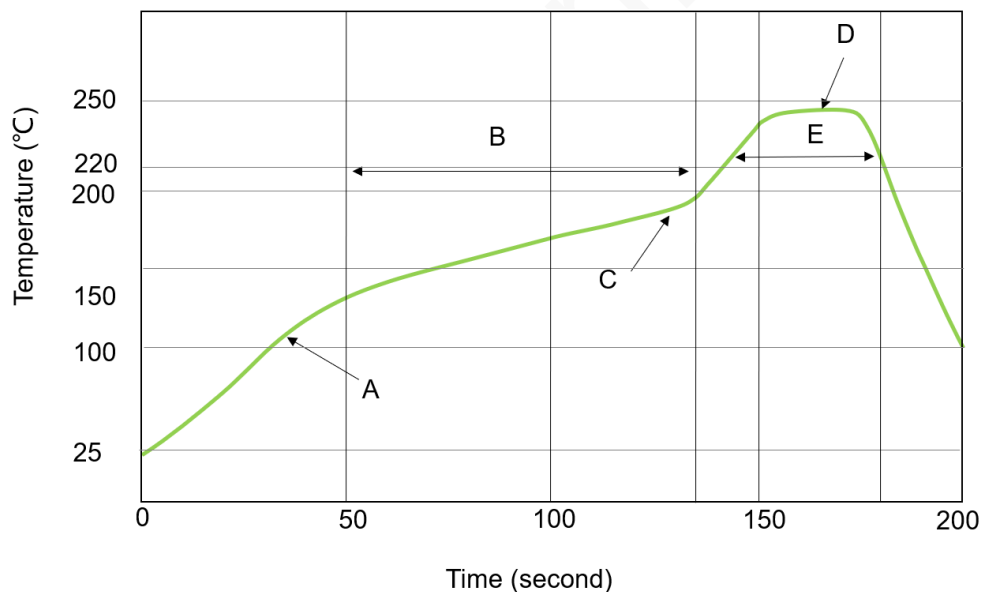
Technical parameters:

- 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

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

For information about cautions in N58 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 245 °C (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 temperatures while removing it. Otherwise, the components inside the module might get misplaced.

8 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, etc.

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

Please follow the requirements below in application design:

- 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 route traces following fire safety standards.

- Please avoid touching the pins of the module directly in case of damages caused by ESD.

- Do not remove the USIM card in idle mode if the module does not support hot-plugging.

A Conformity and Compliance

A.1 Approvals

- CCC
- SRRC
- CE
- RoHS

A.2 Chinese Notice

A.2.1 CCC Class A Digital Device Notice

This product has been tested and found to comply with the limits for class A digital devices. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

A.2.2 Environmental Protection Notice

This product is compliant with China RoHS directives and does not contain any hazardous substances as per the above-referenced standard. Follow the regulations of the countries when storing, applying, and discarding it.

A.3 EU Notice

A.3.1 CE Class A Digital Device Notice

A.3.2 Environmental Protection Notice

This product is compliant with EU RoHS directives and does not contain any hazardous substances as per the above-referenced standard. Follow the regulations of the countries when storing, applying, and discarding it.

REACH

This product complies with the halide-free requirements for PCB regulated in the EN61249-2-21 standard and JCPA-ES-01 2003.

B Abbreviation

Abbreviation	English Full Name
ADC	Analog-Digital Converter
AFC	Automatic Frequency Control
AGC	Automatic Gain Control
AI	Analog Input
AMR	Acknowledged multi-rate (speech coder)
AO	Analog Output
AP	Access Point
ARM	Advanced RISC Machine
BDS	The 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 Networks