# NEO-M9N-00B

## Standard precision GNSS module

### Professional grade

Data sheet


**Abstract**

This data sheet describes the u-blox NEO-M9N-00B GNSS module. NEO-M9N-00B offers ultra-robust meter-level GNSS positioning performance with concurrent reception of up to four GNSS (GPS, GLONASS, BeiDou, Galileo) in a 12.2 x 16.0 mm package.

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# Document information

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| Product status | Corresponding content status | |
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| **Functional Sample** | Draft | For functional testing. Revised and supplementary data will be published later. |
| **In development / prototype** | Objective specification | Target values. Revised and supplementary data will be published later. |
| **Engineering sample** | Advance information | Data based on early testing. Revised and supplementary data will be published later. |
| **Initial production** | Early production information | Data from product verification. Revised and supplementary data may be published later. |
| **Mass production / End of life** | Production information | Document contains the final product specification. |

This document applies to the following products:

| Product name | Type number | FW version | IN/PCN reference | Product status |
|---|---|---|---|---|
| NEO-M9N | NEO-M9N-00B-00 | SPG 4.04 | UBX-21029274<br>UBX-22039049<br>UBX-23000084 | Mass production |

# Contents

# 1 Functional description

## 1.1 Overview

The NEO-M9N-00B GNSS receiver features the u-blox M9 standard precision GNSS platform . It provides exceptional sensitivity and acquisition times for all L1 GNSS systems. u-blox M9 receivers are available in different variants to serve automotive and industrial tracking applications, such as navigation, telematics and UAVs.

u-blox M9 receivers support concurrent reception of four GNSS. The high number of visible satellites allows the receiver to select the best signals. This maximizes the position accuracy, in particular under challenging conditions such as deep urban canyons.

u-blox M9 receivers detect jamming and spoofing events and report them to the host, which allows the system to react to such events. Advanced filtering algorithms mitigate the impact of RF interference and jamming, thus enabling the product to operate as intended. NEO-M9N-00B supports active GNSS in-band filtering that can operate in fixed or adaptive mode for tracking and removal of fast moving or sweeping jammers.

The receiver also provides higher navigation rate and improved security features compared to previous u-blox GNSS generations.

The NEO-M9N-00B module is available in the NEO form factor, which is a 12.2 x 16.0 mm LCC package.

## 1.2 Performance

| Parameter | Specification | |
|---|---|---|
| Receiver type | Multi-constellation GNSS standard precision receiver | |
| Accuracy of time pulse signal | RMS<br>99% | 30 ns<br>60 ns |
| Frequency of time pulse signal | | 0.25 Hz to 10 MHz (configurable) |
| Operational limits[1] | Dynamics<br>Altitude<br>Velocity | ≤ 4 g<br>80,000 m<br>500 m/s |
| Velocity accuracy[2] | | 0.05 m/s |
| Dynamic heading accuracy[2] | | 0.3 deg |

| GNSS | | GPS+GLO+GAL+BDS | GPS+GLO+GAL | GPS+GLO | GPS+BDS | GPS+GAL |
|---|---|---|---|---|---|---|
| Acquisition[3] | Cold start | 24 s | 25 s | 26 s | 28 s | 29 s |
| | Hot start | 2 s | 2 s | 2 s | 2 s | 2 s |
| | Aided start[4] | 2 s | 2 s | 2 s | 2 s | 2 s |
| Max navigation update rate | PVT | 25 Hz | 25 Hz | 25 Hz | 25 Hz | 25 Hz |

1 Assuming Airborne 4 g platform

2 50% at 30 m/s for dynamic operation

3 Commanded starts. All satellites at -130 dBm. GPS always in combination with QZSS and SBAS. Measured at room temperature.

4 Dependent on the speed and latency of the aiding data connection, commanded starts.

| GNSS | | GPS+GLO+GAL+BDS | GPS+GLO+GAL | GPS+GLO | GPS+BDS | GPS+GAL |
|---|---|---|---|---|---|---|
| Sensitivity[5] | Tracking and nav. | -167 dBm | -167 dBm | -167 dBm | -166 dBm | -166 dBm |
| | Reacquisition | -160 dBm | -160 dBm | -160 dBm | -160 dBm | -160 dBm |
| | Cold start | -148 dBm | -148 dBm | -148 dBm | -148 dBm | -148 dBm |
| | Hot start | -159 dBm | -159 dBm | -159 dBm | -159 dBm | -159 dBm |
| Position accuracy | PVT | 2.0 m CEP | 2.0 m CEP | 2.0 m CEP | 2.0 m CEP | 2.0 m CEP |

**Table 1: NEO-M9N-00B typical performance in multi-constellation GNSS modes**

| GNSS | | GPS | GLONASS | BEIDOU | GALILEO |
|---|---|---|---|---|---|
| Acquisition[3] | Cold start | 29 s | 27 s | 32 s | 42 s |
| | Hot start | 2 s | 2 s | 2 s | 2 s |
| | Aided start[4] | 2 s | 2 s | 2 s | 5 s |
| Max navigation update rate | PVT | 25 Hz | 25 Hz | 25 Hz | 25 Hz |
| Sensitivity[5] | Tracking and nav. | -166 dBm | -166 dBm | -160 dBm | -159 dBm |
| | Reacquisition | -160 dBm | -156 dBm | -158 dBm | -154 dBm |
| | Cold start | -148 dBm | -145 dBm | -145 dBm | -140 dBm |
| | Hot start | -159 dBm | -156 dBm | -159 dBm | -154 dBm |
| Position accuracy | PVT | 2.0 m CEP | 4.0 m CEP | 3.0 m CEP | 3.0 m CEP |

**Table 2: NEO-M9N-00B typical performance in single-GNSS modes**

## 1.3 Supported GNSS constellations

The NEO-M9N-00B is a concurrent GNSS receiver which can receive and track multiple GNSS systems. The NEO-M9N-00B receiver can be configured for concurrent GPS, GLONASS, Galileo and BeiDou plus SBAS and QZSS reception. If power consumption is a key factor, then the receiver can be configured for a subset of GNSS constellations.

Supported GNSS systems and their signals are:

| GPS / QZSS | GLONASS | Galileo | BeiDou |
|---|---|---|---|
| L1C/A (1575.42 MHz) | L1OF (1602 MHz + k*562.5 kHz, k = –7,..., 5, 6) | E1-B/C (1575.42 MHz) | B1I (1561.098 MHz) |

**Table 3: Supported GNSS systems and signals**

The following GNSS assistance services can be activated:

| AssistNow™ Online | AssistNow™ Offline | AssistNow™ Autonomous |
|---|---|---|
| Supported | Supported | Supported[6] |

**Table 4: Supported assisted GNSS (A-GNSS) services**

NEO-M9N-00B supports the following augmentation systems:

| SBAS | QZSS | IMES | Differential GNSS |
|---|---|---|---|
| EGNOS, GAGAN, MSAS and WAAS supported | L1S supported | Not supported | RTCM 3.3 |

**Table 5: Supported augmentation systems**

☞ The SBAS and QZSS augmentation systems can be enabled only if GPS operation is also enabled.

5 Demonstrated with a good external LNA. Measured at room temperature.

6 AssistNow Autonomous is enabled by default.

## 1.4 Supported protocols

The NEO-M9N-00B supports the following protocols:

| Protocol | Type |
|---|---|
| UBX | Input/output, binary, u-blox proprietary |
| NMEA 4.10 (default), 4.0, 2.3, and 2.1 | Input/output, ASCII |
| RTCM 3.3 | Input, binary |

**Table 6: Supported protocols**

For specification of the protocols, see the Interface description [1].

## 1.5 Firmware features

| Feature | Description |
|---|---|
| Assisted GNSS | AssistNow Online, AssistNow Offline and AssistNow Autonomous supported |
| Backup modes | Hardware backup mode, software backup mode |
| Data batching | Autonomous tracking up to 5 min. |
| Data-logger | Position, velocity, time, and odometer data |
| Geofencing | Up to 4 circular areas |
| Power save modes | On/off, cyclic |
| Odometer | Measure traveled distance with support for different user profiles |
| Upgradeable firmware | Firmware in flash memory can be upgraded |

**Table 7: Firmware features**

| Feature | Description |
|---|---|
| Anti-jamming | RF interference and jamming detection and reporting; Active GNSS in-band filtering |
| Anti-spoofing | Spoofing detection and reporting |
| Configuration lockdown | Receiver configuration can be locked by command |
| Message integrity | All messages signed with SHA-256 |
| Secure boot | Only signed FW images executed |
| JTAG debug port | Locked by default |

**Table 8: Security features**

# 2 System description

## 2.1 Block diagram

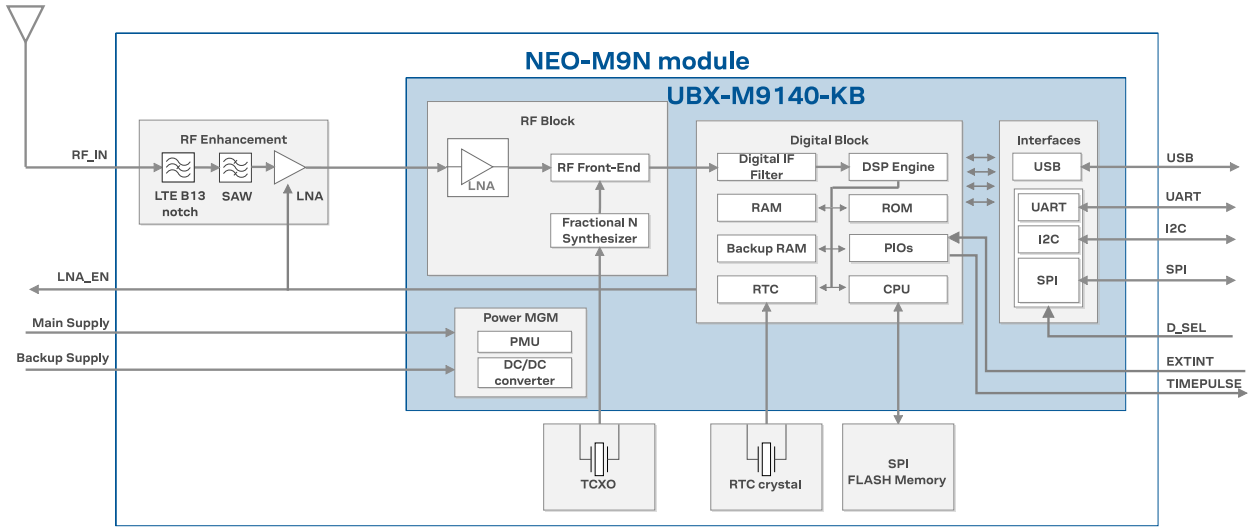


**Figure 1: NEO-M9N-00B block diagram**

# 3 Pin definition

## 3.1 Pin assignment

The pin assignment of the NEO-M9N-00B module is shown in Figure 2. The defined configuration of the PIOs is listed in Table 9.

For detailed information on pin functions and characteristics, see the integration manual [3].

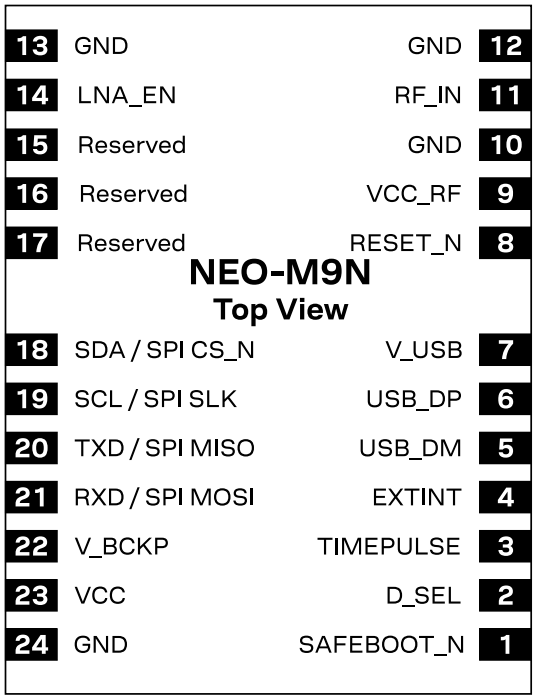


**Figure 2: NEO-M9N-00B pin assignment**

| Pin no. | Name | I/O | Description |
|---|---|---|---|
| 1 | SAFEBOOT_N | I | SAFEBOOT_N (used for FW updates and reconfiguration, leave open) |
| 2 | D_SEL | I | Interface select (open or VCC = UART + I2C; GND = SPI) |
| 3 | TIMEPULSE | O | TIMEPULSE (1 PPS) |
| 4 | EXTINT | I | EXTINT (PIO 7) |
| 5 | USB_DM | I/O | USB data (DM) |
| 6 | USB_DP | I/O | USB data (DP) |
| 7 | V_USB | I | USB supply |
| 8 | RESET_N | I | RESET (active low) |
| 9 | VCC_RF | O | Voltage for external LNA |
| 10 | GND | I | Ground |
| 11 | RF_IN | I | GNSS signal input |
| 12 | GND | I | Ground |
| 13 | GND | I | Ground |
| 14 | LNA_EN | O | Antenna/LNA control |
| 15 | Reserved | - | Reserved |
| 16 | Reserved | - | Reserved |

| Pin no. | Name | I/O | Description |
|---|---|---|---|
| 17 | Reserved | - | Reserved |
| 18 | SDA / SPI CS_N | I/O | I2C data if D_SEL = VCC (or open); SPI chip select if D_SEL = GND |
| 19 | SCL / SPI SLK | I/O | I2C clock if D_SEL = VCC (or open); SPI clock if D_SEL = GND |
| 20 | TXD / SPI MISO | O | UART output if D_SEL = VCC (or open); SPI MISO if D_SEL = GND |
| 21 | RXD / SPI MOSI | I | UART input if D_SEL = VCC (or open); SPI MOSI if D_SEL = GND |
| 22 | V_BCKP | I | Backup voltage supply |
| 23 | VCC | I | Supply voltage |
| 24 | GND | I | Ground |

**Table 9: NEO-M9N-00B pin assignment**

☞ For detailed information on the pin functions and characteristics see the integration manual [3].

# 4 Electrical specification

**CAUTION** Operating the device above one or more of the limiting values may cause permanent damage to the device. The values provided in this chapter are stress ratings. Extended exposure to the values outside the limits may effect the device reliability.

Where application information is given, it is advisory only and does not form part of the specification.

For detailed information on the device integration, see the integration manual [3].

## 4.1 Absolute maximum ratings

| Parameter | Symbol | Condition | Min | Max | Units |
|---|---|---|---|---|---|
| Power supply voltage | VCC | | -0.5 | 3.6 | V |
| Voltage ramp on VCC[7] | | | 20 | 8000 | µs/V |
| Backup battery voltage | V_BCKP | | -0.5 | 3.6 | V |
| Input pin voltage | Vin | VCC ≤ 3.1 V | -0.5 | VCC + 0.5 | V |
| | | VCC > 3.1 V | -0.5 | 3.6 | V |
| VCC_RF output current | ICC_RF | | | 200 | mA |
| Supply voltage USB | V_USB | | –0.5 | 3.6 | V |
| USB signals | USB_DM, USB_DP | | -0.5 | V_USB + 0.5 | V |
| Input power at RF_IN | Prfin | source impedance = 50 Ω, continuous wave | | 13[8] | dBm |
| Storage temperature | Tstg | | -40 | +85 | °C |

**Table 10: Absolute maximum ratings**

**CAUTION** Risk of equipment damage. This product is not protected against overvoltage or reversed voltages. Use appropriate protection diodes to avoid voltage spikes exceeding the specified boundaries damaging the equipment.

## 4.2 Operating conditions

The values for the following operating conditions have been specified at 25°C ambient temperature. Extreme operating temperatures can significantly impact the specified values. If an application operates near the min or max temperature limits, ensure the specified values are not exceeded.

| Parameter | Symbol | Min | Typical | Max | Units | Condition |
|---|---|---|---|---|---|---|
| Power supply voltage | VCC | 2.7 | 3.0 | 3.6 | V | |
| Supply voltage for USB interface | V_USB | 3.0 | | 3.6 | V | |
| Backup battery voltage | V_BCKP | 1.65 | | 3.6 | V | |
| Backup battery current[9] | I_BCKP | | 45 | | µA | V_BCKP = 3 V, VCC = 0 V |
| SW backup current | I_SWBCKP | | 0.36 | | mA | |
| Input pin voltage range | Vin | 0 | | VCC | V | |

7 Exceeding the ramp speed may permanently damage the device

8 +13 dBm for outband; 0 dBm for inband

9 To measure the I_BCKP the receiver should first be switched on, i.e. VCC and V_BCKP is available. Then set VCC to 0 V while the V_BCKP remains available. Afterward measure the current consumption at the V_BCKP.

| Parameter | Symbol | Min | Typical | Max | Units | Condition |
|---|---|---|---|---|---|---|
| Digital IO pin low level input voltage | Vil | | | 0.4 | V | |
| Digital IO pin high level input voltage | Vih | 0.8 * VCC | | | V | |
| Digital IO pin low level output voltage | Vol | | | 0.4 | V | Iol = 2 mA[10] |
| Digital IO pin high level output voltage | Voh | VCC – 0.4 | | | V | Ioh = 2 mA[10] |
| DC current through any digital I/O pin (except supplies) | Ipin | | | 5 | mA | |
| Pull-up resistance for SCL, SDA | $R_{pu}$ | 7 | 15 | 30 | kΩ | |
| Pull-up resistance for D_SEL, RXD, TXD, SAFEBOOT_N, EXTINT | $R_{pu}$ | 30 | 75 | 130 | kΩ | |
| Pull-up resistance for RESET_N | $R_{pu}$ | 7 | 10 | 13 | kΩ | |
| Voltage at USB pins | V_USBIO | 0 | | V_USB | V | |
| VCC_RF voltage | VCC_RF | | VCC - 0.1 | | V | |
| VCC_RF output current | ICC_RF | | | 50 | mA | |
| Receiver chain noise figure[11] | NFtot | | 3.5 | | dB | |
| External gain (at RF_IN) | Ext_gain | | | 30 | dB | |
| Operating temperature | Topr | -40 | +25 | +85 | °C | |

**Table 11: Operating conditions**

☞ Operation beyond the specified operating conditions can affect the device reliability.

## 4.3 Indicative power requirements

Table 12 provides examples of typical current requirements when using a cold start command. The given values are total system supply current for a possible application including RF and baseband sections.

☞ The actual power requirements vary depending on the FW version used, external circuitry, number of satellites tracked, signal strength, type and time of start, duration, and conditions of test.

| Symbol | Parameter | Conditions | GPS+GLO+GAL+BDS | GPS+GLO | GPS | Unit |
|---|---|---|---|---|---|---|
| $I_{PEAK}$ | Peak current | Acquisition | 100 | 100 | 100 | mA |
| $I_{VCC}$[12, 13] | VCC current | Acquisition | 50 | 43 | 36 | mA |
| | | Tracking (Continuous mode) | 36 | 32 | 28 | mA |
| | | Tracking (Power save mode)[14] | 21 | 20 | 19 | mA |

**Table 12: Currents to calculate the indicative power requirements**

All values in Table 12 are measured at 25 °C ambient temperature. SBAS and QZSS are activated in all measurements.

10 TIMEPULSE has 4 mA current drive/sink capability

11 Only valid for GPS

12 Simulated signal, current measured at 3.0 V

13 Navigation update rate 1 Hz

14 Cyclic tracking operation

# 5 Communications interfaces

The NEO-M9N-00B has several communications interfaces, including UART, SPI, I2C and USB.

All the inputs have internal pull-up resistors in normal operation and can be left open if not used. All the PIOs are supplied by VCC, therefore all the voltage levels of the PIO pins are related to VCC supply voltage.

## 5.1 UART

The NEO-M9N-00B has one UART interface which supports configurable baud rates. See the integration manual [3].

Hardware flow control is not supported.

The UART1 is enabled if D_SEL pin of the module is left open or "high".

| Symbol | Parameter | Min | Max | Unit |
|---|---|---|---|---|
| $R_u$ | Baud rate | 4800 | 921600 | bit/s |
| $\Delta_{Tx}$ | Tx baud rate accuracy | -1% | +1% | - |
| $\Delta_{Rx}$ | Rx baud rate tolerance | -2.5% | +2.5% | - |

**Table 13: NEO-M9N-00B UART specifications**

## 5.2 SPI

The SPI interface is disabled by default. The SPI interface shares pins with UART and I2C and can be selected by setting D_SEL = 0. The SPI interface can be operated in slave mode only. The maximum transfer rate using SPI is 125 kB/s and the maximum SPI clock frequency is 5.5 MHz.

The SPI timing parameters for slave operation are defined in Figure 3. Default SPI configuration is CPOL = 0 and CPHA = 0.

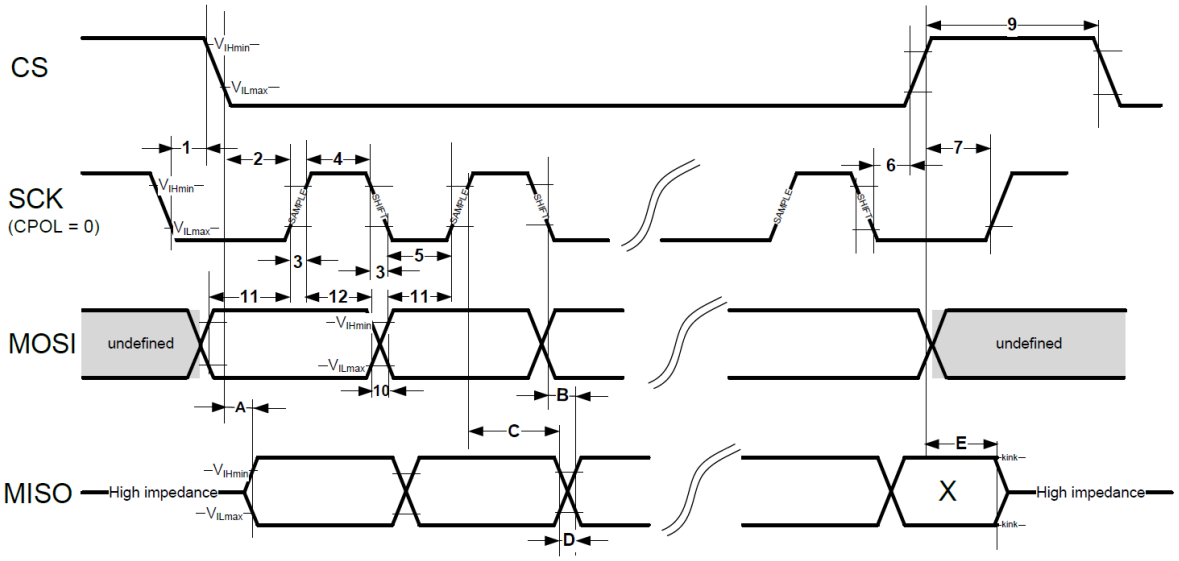


**Figure 3: NEO-M9N-00B SPI specification mode 1: CPHA=0 SCK = 5.33 MHz**

| Symbol | Parameter | Min | Max | Unit |
|---|---|---|---|---|
| 1 | CS deassertion hold time | 23 | - | ns |

| Symbol | Parameter | Min | Max | Unit |
|---|---|---|---|---|
| 2 | Slave select time (CS to SCK) | 20 | - | ns |
| 3 | SCK rise/fall time | - | 7 | ns |
| 4 | SCK high time | 24 | - | ns |
| 5 | SCK low time | 24 | - | ns |
| 6 | Slave deselect time (SCK falling to CS) | 30 | - | ns |
| 7 | Slave deselect time (CS to SCK) | 30 | - | ns |
| 9 | CS high time | 32 | - | ns |
| 10 | MOSI transition time | - | 7 | ns |
| 11 | MOSI setup time | 16 | - | ns |
| 12 | MOSI hold time | 24 | - | ns |

**Table 14: SPI slave input timing parameters 1 - 12**

| Symbol | Parameter | Min | Max | Unit |
|---|---|---|---|---|
| A | MISO data valid time (CS) | 12 | 40 | ns |
| B | MISO data valid time (SCK), weak driver mode | 15 | 40 | ns |
| C | MISO data hold time | 100 | 140 | ns |
| D | MISO rise/fall time, weak driver mode | 0 | 5 | ns |
| E | MISO data disable lag time | 15 | 35 | ns |

**Table 15: SPI slave timing parameters A - E, 2 pF load capacitance**

| Symbol | Parameter | Min | Max | Unit |
|---|---|---|---|---|
| A | MISO data valid time (CS) | 16 | 55 | ns |
| B | MISO data valid time (SCK), weak driver mode | 20 | 55 | ns |
| C | MISO data hold time | 100 | 150 | ns |
| D | MISO rise/fall time, weak driver mode | 3 | 20 | ns |
| E | MISO data disable lag time | 15 | 35 | ns |

**Table 16: SPI slave timing parameters A - E, 20 pF load capacitance**

| Symbol | Parameter | Min | Max | Unit |
|---|---|---|---|---|
| A | MISO data valid time (CS) | 26 | 85 | ns |
| B | MISO data valid time (SCK), weak driver mode | 30 | 85 | ns |
| C | MISO data hold time | 110 | 160 | ns |
| D | MISO rise/fall time, weak driver mode | 13 | 45 | ns |
| E | MISO data disable lag time | 15 | 35 | ns |

**Table 17: SPI slave timing parameters A - E, 60 pF load capacitance**

## 5.3 I2C

An I2C interface is available for communication with an external host CPU in I2C Fast-mode. Backwards compatibility with Standard-mode I2C bus operation is not supported. The interface can be operated only in slave mode with a maximum bit rate of 400 kbit/s. The interface can make use of clock stretching by holding the SCL line LOW to pause a transaction. In this case, the bit transfer rate is reduced. The maximum clock stretching time is 20 ms.

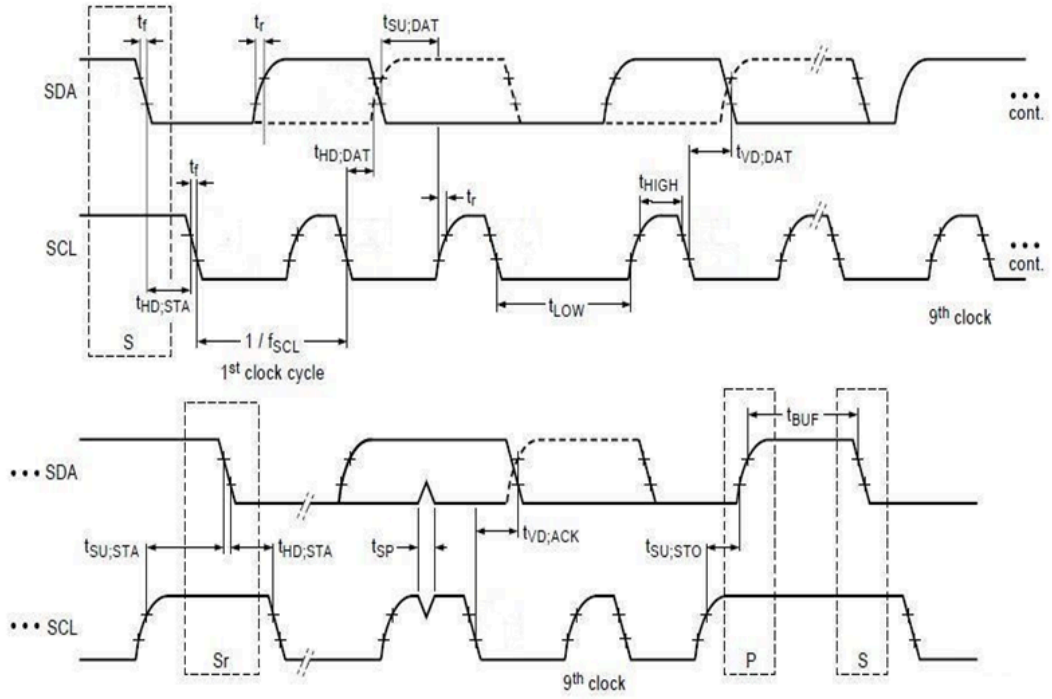


**Figure 4: NEO-M9N-00B I2C slave specification**

| | | I2C Fast-mode | | |
|---|---|---|---|---|
| **Symbol** | **Parameter** | **Min** | **Max** | **Unit** |
| $f_{SCL}$ | SCL clock frequency | 0 | 400 | kHz |
| $t_{HD;STA}$ | Hold time (repeated) START condition | 0.6 | - | µs |
| $t_{LOW}$ | Low period of the SCL clock | 1.3 | - | µs |
| $t_{HIGH}$ | High period of the SCL clock | 0.6 | - | µs |
| $t_{SU;STA}$ | Setup time for a repeated START condition | 0.6 | - | µs |
| $t_{HD;DAT}$ | Data hold time | 0 [15] | - [16] | µs |
| $t_{SU;DAT}$ | Data setup time | 100 [17] | | ns |
| $t_r$ | Rise time of both SDA and SCL signals | - | 300 (for C = 400pF) | ns |
| $t_f$ | Fall time of both SDA and SCL signals | - | 300 (for C = 400pF) | ns |
| $t_{SU;STO}$ | Setup time for STOP condition | 0.6 | - | µs |
| $t_{BUF}$ | Bus-free time between a STOP and START condition | 1.3 | - | µs |
| $t_{VD;DAT}$ | Data valid time | - | 0.9 [16] | µs |
| $t_{VD;ACK}$ | Data valid acknowledge time | - | 0.9 [16] | µs |
| $V_{nL}$ | Noise margin at the low level | 0.1 VCC | - | V |
| $V_{nH}$ | Noise margin at the high level | 0.2 VCC | - | V |

**Table 18: NEO-M9N-00B I2C slave timings and specifications**

15 External device must provide a hold time of at least one transition time (max 300 ns) for the SDA signal (with respect to the min Vih of the SCL signal) to bridge the undefined region of the falling edge of SCL.

16 The maximum $t_{HD;DAT}$ must be less than the maximum $t_{VD;DAT}$ or $t_{VD;ACK}$ with a maximum of 0.9 µs by a transition time. This maximum must only be met if the device does not stretch the LOW period (tLOW) of the SCL signal. If the clock stretches the SCL, the data must be valid by the set-up time before it releases the clock.

17 When the I2C slave is stretching the clock, the $t_{SU;DAT}$ of the first bit of the next byte is 62.5 ns.

☞ The I2C interface is only available with the UART default mode. If the SPI interface is selected by using D_SEL = 0, the I2C interface is not available.

## 5.4 USB

The USB 2.0 FS (full speed, 12 Mbit/s) interface can be used for host communication. Due to the hardware implementation, it may not be possible to certify the USB interface. The V_USB pin supplies the USB interface.

## 5.5 Default interface settings

| Interface | Settings |
|---|---|
| UART | 38400 baud, 8 bits, no parity bit, 1 stop bit. |
| | Output messages: NMEA **GGA, GLL, GSA, GSV, RMC, VTG, TXT** (no UBX). |
| | Input protocols: UBX, NMEA and RTCM 3.3. |
| USB | Output messages activated as in UART. Input protocols available as in UART. |
| I2C | Output messages activated as in UART. Input protocols available as in UART. |
| SPI | Output messages activated as in UART. Input protocols available as in UART. |

**Table 19: Default interface settings**

☞ Refer to the applicable interface description [1] for information about further settings.

By default the NEO-M9N-00B outputs NMEA messages that include satellite data for all GNSS bands being received. This results in a higher-than-before NMEA load output for each navigation period. Make sure the UART baud rate being used is sufficient for the selected navigation rate and the number of GNSS signals being received.

# 6 Mechanical specification

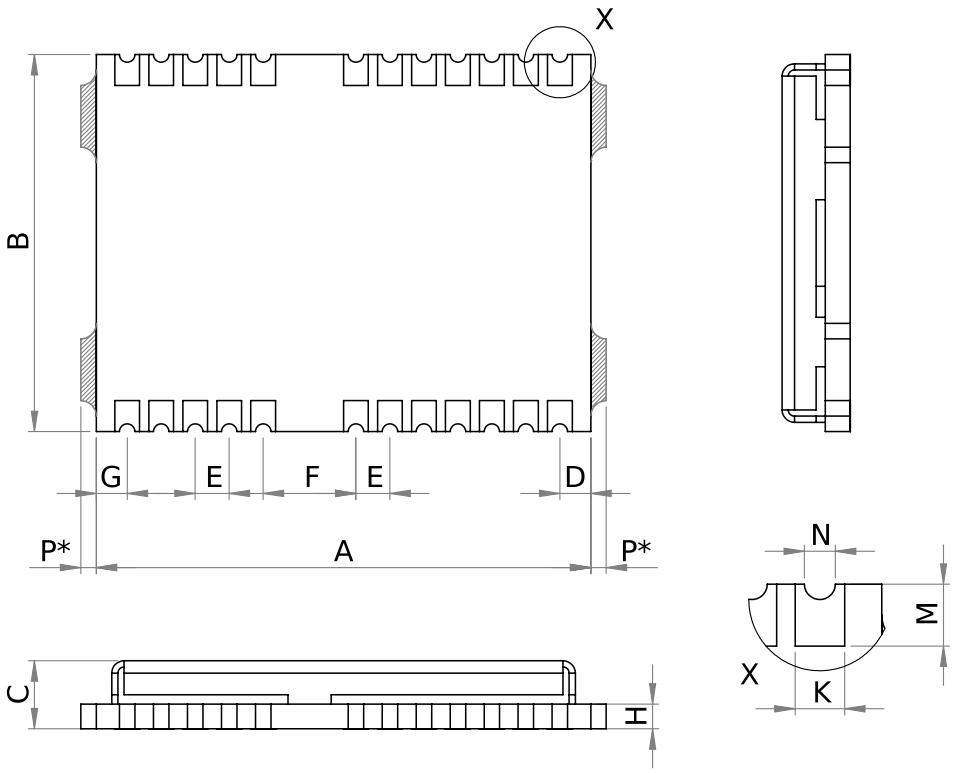


**Figure 5: NEO-M9N-00B mechanical drawing**

| Symbol | Min (mm) | Typical (mm) | Max (mm) | |
|---|---|---|---|---|
| A | 15.9 | 16.0 | 16.1 | |
| B | 12.1 | 12.2 | 12.3 | |
| C | 2.2 | 2.4 | 2.6 | |
| D | 0.9 | 1.0 | 1.1 | |
| E | 1.0 | 1.1 | 1.2 | |
| F | 2.9 | 3.0 | 3.1 | |
| G | 0.9 | 1.0 | 1.1 | |
| H | - | 0.82 | - | |
| K | 0.7 | 0.8 | 0.9 | |
| M | 0.8 | 0.9 | 1.0 | |
| N | 0.4 | 0.5 | 0.6 | |
| P* | 0.0 | - | 0.5 | The de-paneling residual tabs may be on either side (not both). |
| Weight | | 1.6 g | | |

**Table 20: NEO-M9N-00B mechanical dimensions**

☞ The mechanical picture of the de-paneling residual tabs (P*) is an approximate representation, shape and position may vary.

☞ Component keep-out area must consider that the de-paneling residual tabs can be on either side (not both).

# 7 Reliability tests and approvals

NEO-M9N-00B modules are based on AEC-Q100 qualified GNSS chips.

Tests for product family qualifications comply with ISO 16750 "Road vehicles – environmental conditions and testing for electrical and electronic equipment", and appropriate standards.

## 7.1 Approvals

NEO-M9N-00B complies with the essential requirements and other relevant provisions of the Radio Equipment Directive (RED) 2014/53/EU.

NEO-M9N-00B complies with the Directive 2011/65/EU (EU RoHS 2) and its amendment Directive (EU) 2015/863 (EU RoHS 3).

The Declaration of Conformity (DoC) is available on the u-blox website.

# 8 Labeling and ordering information

This section provides information about product labeling and ordering. For information about moisture sensitivity level (MSL), product handling and soldering see the Integration manual [3].

## 8.1 Product labeling

The labeling of the NEO-M9N-00B modules provides product information and revision information. For more information contact u-blox sales.

## 8.2 Explanation of product codes

Three product code formats are used in the NEO-M9N-00B labels. The **Product name** used in documentation such as this data sheet identifies all u-blox products, independent of packaging and quality grade. The **Ordering code** includes options and quality, while the **Type number** includes the hardware and firmware versions.

Table 21 below details these three formats.

| Format | Structure | Product code |
|---|---|---|
| Product name | PPP-TGV | NEO-M9N |
| Ordering code | PPP-TGV-NNQ | NEO-M9N-00B |
| Type number | PPP-TGV-NNQ-XX | NEO-M9N-00B-00 |

**Table 21: Product code formats**

The parts of the product code are explained in Table 22.

| Code | Meaning | Example |
|---|---|---|
| PPP | Product family | NEO |
| TG | Platform | M9 = u-blox M9 |
| V | Variant | N = Standard precision with SAW and LNA |
| NNQ | Option / Quality grade | NN: Option [00...99]<br>Q: Grade, A = Automotive, B = Professional |
| XX | Product detail | Describes hardware and firmware versions |

**Table 22: Part identification code**

## 8.3 Ordering codes

| Ordering code | Product | Remark |
|---|---|---|
| NEO-M9N-00B | u-blox NEO-M9N module, professional grade | |

**Table 23: Product ordering codes**

☞ Product changes affecting form, fit or function are documented by u-blox. For a list of Product Change Notifications (PCNs) see our website at: https://www.u-blox.com/en/product-resources.

# Related documents

[1] u-blox M9 SPG 4.04 Interface description, UBX-21022436
u-blox M9 SPG 4.04 Interface description, UBX-21022437 (NDA required)
[2] u-blox M9 SPG 4.04 Release notes, UBX-20036165
[3] NEO-M9N Integration manual, UBX-19014286
NEO-M9N Integration manual, UBX-19015769 (NDA required)

☞ For regular updates to u-blox documentation and to receive product change notifications please register on our homepage https://www.u-blox.com.

# Revision history

| Revision | Date | Name | Status / comments |
|---|---|---|---|
| R01 | 15-Aug-2019 | jesk | Objective specification |
| R02 | 14-Nov-2019 | jesk | Advance information |
| R03 | 24-Jan-2020 | jesk | Advance information.<br>Added out-band value for Prfin, renamed VDD_USB to V_USB. |
| R04 | 11-Sep-2020 | jesk | Early production information.<br>- Updated firmware to SPG 4.04.<br>- Updated I_BCKP and indicative power consumption values.<br>- Added supported voltage range for V_USB.<br>- Added value for Ext_gain, External gain at RF_IN.<br>- Added digital I/O pin DC current and pull up resistance values.<br>- Clarified UART timing specifications.<br>- Clarified use of USB interface. |
| R05 | 09-Jul-2021 | jesk | Document status replaced by Product status in Document information.<br>- Updated product name to include product option and quality grade<br>- Updated GLONASS tracking sensitivity<br>- Updated supported GNSS constellations: QZSS L1C/A support now listed<br>- Updated QZSS augmentation service name<br>- Updated Absolute maximum ratings: supply voltage ramp requirements |
| R06 | 14-Dec-22 | rmak | Updated section Mechanical specification |
| R07 | 27-Mar-2023 | rmak | Updated sections<br>- Document information: updated IN/PCN reference<br>- Absolute maximum ratings: updated maximum VCC_RF output current<br>- DC electrical characteristics: updated TIMEPULSE drive strength<br>- Indicative power requirements: current measured at 1 Hz navigation update rate, updated hardware backup mode current<br>- SPI: updated timing specification<br>- I2C: updated timing specification |

# Contact

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For further support and contact information, visit us at www.u-blox.com/support.