



NTL103.SMT

OEM GNSS MODULE

Overview

2021



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1 TECHNICAL DOCUMENTS

The complete information about **NTL103.SMT** includes:

- **Actual overview.** It contains information about **NTL103.SMT** structure, its basic features, technical specifications, interfaces, pin definitions, etc. It gives some utilization aspects specific for particular receiver structure.
- **GNSS-PPU-SETUP-GUIDE-AA-BB-CC.pdf.** It describes the concept of PPU (Primary Processing Unit), the basic object of NTLab company's OEM modules. It contains detailed information about operational aspects of GNSS receivers which have AA-BB version of embedded firmware (CC – revision of the document). Then **NTL103.SMT** structure will be described in terms of PPU. Refer to this document to get information about available operational modes, control parameters, some internal logic aspects and interface commands which are used to control the **NTL103.SMT** performance.
- **GNSS-DCP-BUILD-AA-BB-CC.pdf.** It contains information about Data Communication Protocols from the firmware version AA-BB. It describes how to parse data coming from **NTL103.SMT**, how to construct control commands and how to use the module in the most optimal way.
- **NTL103.SMT-BROWSER-GUIDE-CC.pdf** It contains a quick guide with NTL Browser application and describes how to connect **NTL103.SMT** to PC.
- **GNSS-ADAPTER-2-MANUAL-CC.pdf.** It contains information about interface adapter which can be used at the testing stage for access to the available **NTL103.SMT** interfaces.

Documents can be revised by NTLab at any time. Visit www.ntlab.it or NTLab company's **FTP server** for the latest version of the documents.

2 INTRODUCTION

NTL103.SMT OEM module supports multiple frequencies and multiple constellations including GPS, GLONASS, NavIC and SBAS signals to improve the continuity and reliability of positioning.

It can be used for the following purposes:

- as a source of navigational data (Position, Velocity, Time) in autonomous mode (standalone mode, DGPS), 1Hz;
- as a source of raw ranging measurements (include pseudoranges, measured by code and carrier phase), 20Hz.

The top view of NTL103.SMT and its dimensions are shown in figure 1.2.

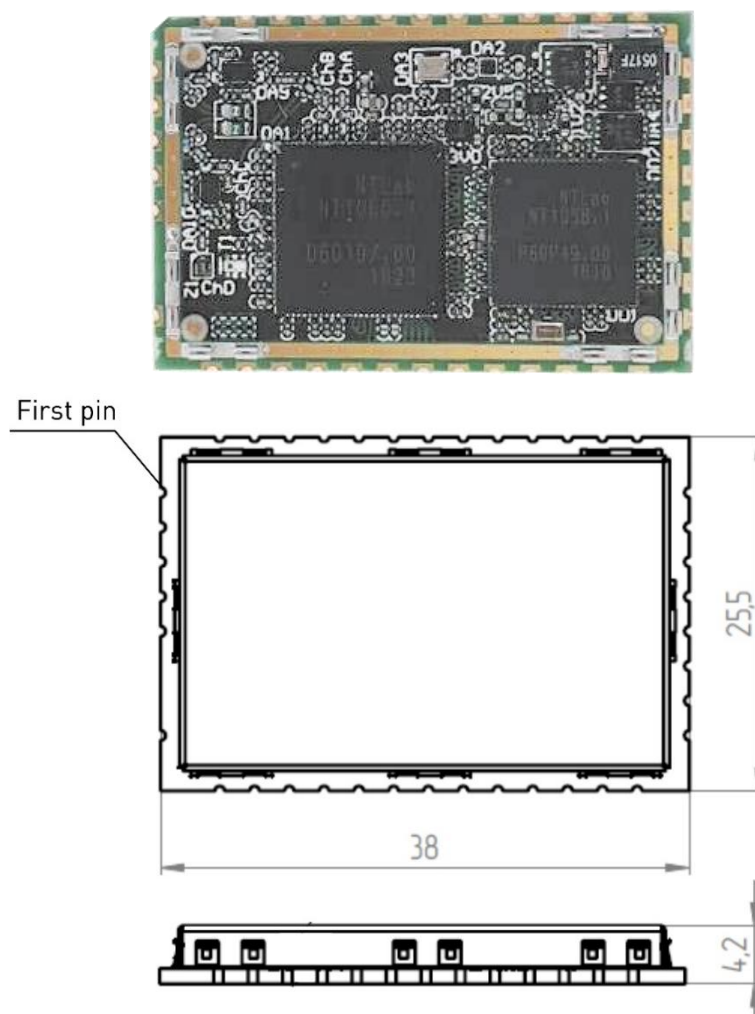


Figure 1.1 – NTL103.SMT OEM module top view and dimensions, mm

Shield is mounted on the module to improve EMC. This done using the contact pads on the PCB. The warranty after shield modification is on the user's own responsibility.

3 BLOCK DIAGRAM

The general block diagram of **NTL103.SMT** is shown in figure 3.1.

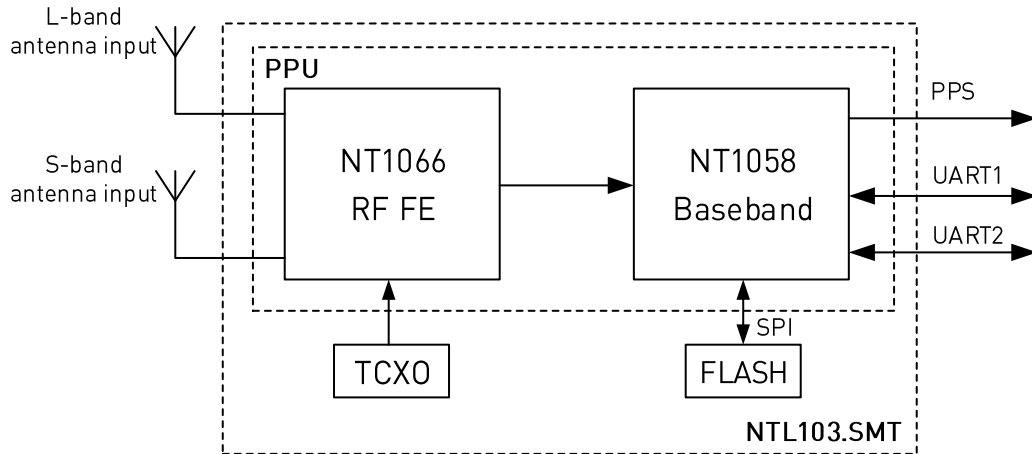


Figure 3.1 – The block diagram of **NTL103.SMT**

Primary Processing Unit (PPU) is a basic functional block of **NTL103.SMT** module. Refer to the «GNSS-PPU-SETUP-GUIDE-AA-BB-CC.pdf» for details.

PPU implements following functions:

- computation of Position and Velocity in standalone and SBAS modes;
- computation of precise Time and generation of Pulse Per Second (PPS) strobes;
- generation of raw ranging measurements based on code and carrier phase measurements.

PPU is implemented on chips set which are designed by NTLab company:

- NT1066 is a 4-channel L1, L2, L5, S multi-bands Radio-Frequency Front-End (RF FE) integrated circuit for GNSS signals receiving and their primary processing;
- NT1058 is microcontroller which includes digital baseband processor and 64 dual channels hardware correlator for GNSS signals tracking and primary processing of digital signals.

NTL103.SMT contains on-module SPI serial flash memory to store two configurations. Firmware upgrade is possible through any of UART channels.

The *PPS* is a time synchronization output signal from NT1058 with 1 second period (corresponds to the frequency of navigation solution). Voltage logic level is 2.5V, pulse width is 200us.

NTL103.SMT has two physical UART ports (UART1 and UART2) which can be used to transmit navigation information in the autonomous mode, to output raw ranging measurements, to monitor status information and configure the module. Each of the serial ports consist of RX and TX line. The baud rates can be set individually for each serial port. Refer to Chapter 6 for information about default UART settings.

Power supply:

NTL103.SMT host-device must provide DC voltage for module and antenna power supply:

- 3.3...5.5V DC **module power supply** is provided from Pin 29;
- 5V DC **antenna power supply** is provided from Pin 41.

GNSS external active antenna requirements:

- Antenna voltage supply 5V;
- Maximum current 100mA;
- LNA gain range (minus signal loss) 20...35dB.

4 PIN DEFINITION

The pinout of **NTL103.SMT** module is shown in figure 4.1.

Pins assignment is presented in the Table 4.1.

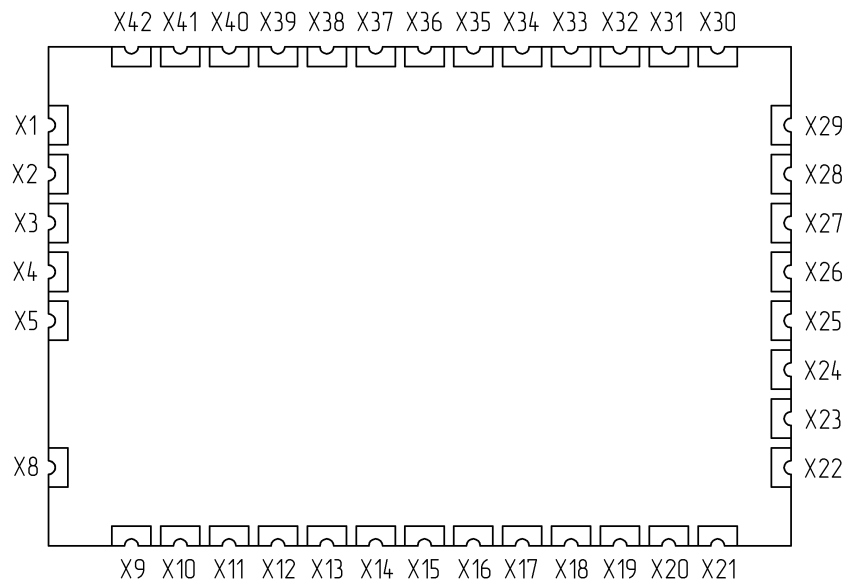


Figure 4.1 – Pinout of **NTL103.SMT** module

Table 4.1 – **NTL103.SMT** module pins assignment

Pin number	Name	Type	Description
X1, X3, X5, X8, X28, X30, X35, X37, X39, X40, X42	GND	Power	Signal and Power Ground
X2	RF_IN_L	Input	L-band antenna input
X4	RF_IN_S	Input	S-band antenna input
X9	66_SCK	Input	NT1066 ¹ SPI
X10	66_MOSI	Input	NT1066 ¹ SPI
X11	66_MISO	Output	NT1066 ¹ SPI
X12	66_CS	Input	NT1066 ¹ SPI
X13	Ready	I/O	General Purpose I/O
X14	LED_PC5	Output	NT1058 Ready signal

¹ Used for service purposes

Table continuation 4.1 – NTL103.SMT module pins assignment

Pin number	Name	Type	Description
X15	AOK	Output	NT1066 Ready signal ("All OK")
X16	Vbat	Power	Battery power input
X17	PPS1	Output	PPS time mark
X18	PPS_0	Input	External sync input
X19	UART2_TX	Output	UART transmit data
X20	UART2_RX	Input	UART receive data
X21	DBGCLK	I/O	NT1058 ² programming and debugging
X22	DBGIO	I/O	NT1058 ² programming and debugging
X23	nPOR	Input	NT1058 ² programming and debugging
X24	UART1_TX	Output	UART transmit data
X25	UART1_RX	Input	UART receive data
X26	BOOT	Input	Boot mode selection
X27	DEF	I/O	General Purpose I/O
X29	Vin	Power	OEM module supply voltage
X31	58_CS	Output	NT1058 ² SPI
X32	58_MISO	Input	NT1058 ² SPI
X33	58_MOSI	Output	NT1058 ² SPI
X34	58_CLK	Output	NT1058 ² SPI
X36	TCXO_EN	Input	Internal TCXO enabled
X38	TCXO_EXT	Input	External input of the TCXO
X41	ANT_Vcc	Power	Antenna power input

² Used for service purposes only

5 SPECIFICATION

The limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134).

Table 5.1 – Specification of NTL103.SMT

SUPPORTED GNSS CONSTELLATIONS		
GPS L1,L2, GLONASS L1,L2, NavIC L5,S-band and SBAS L1		
TECHNICAL SPECIFICATION		
Parameter	Value	Note
Measurement Precision (RMS): – C/A pseudoranges, cm – L1, L2 carrier phase, mm	20 0.8	Smoothed pseudoranges
Standalone mode Accuracy (RMS): – Position Horizontal/Vertical, m	2.1 / 3.5	Depends on atmospheric conditions, satellite visibility and geometry, multipath conditions, GNSS antenna
DGPS mode Accuracy (RMS): – Position Horizontal/Vertical, m	0.8/1.1	GPS+SBAS
Velocity Accuracy (RMS): – Velocity Horizontal/Vertical, m/s:	0.02/0.03	
Data update rates: – Position, Velocity, Time, Hz – Raw data, Hz	1 20	no options 1,2,5,10 Hz available
Electrical parameters: – Supply voltage, V – Power consumption, W	3.3...5.5 Min 0.19 / Max 0.9	
Environmental characteristics: – Operating temperature, °C – Storage temperature, °C	-40° to +80°C -55° to +85°C	
Weight and size: – Dimensions (L x W x H), mm; – Weight (without package), g	38 x 25.5 x 4.2 < 15	

Warning: The product is not protected against overvoltage or reversed voltages. All specifications are at an ambient temperature of 25 °C. Extreme operating temperatures can significantly impact specification values.

6 COMMUNICATION INTERFACES

The following external interfaces are available: 2xUART, 1xPPS out (CMOS 2.5).

There are several interface protocols: RTCM3.3 (MSM+Legacy messages), NovAtel OEM, NMEA-0183, NTL Binary.

Table 6.1 – Interface settings

Interface	Description
UART1 Tx/Rx	<i>Available data transmission formats:</i> <ul style="list-style-type: none">• NMEA-0183 or NTL Binary for nav. data transmission and control;• RTCM 3.3 or Novatel OEMv7 for raw ranging data transmission. <i>Available baud rate diapason: 9600 to 460800.</i> <i>Default settings: 115200 Baud, 8 bits, no parity bit, 1 stop bit, NMEA.</i>
UART2 Tx/Rx	<i>Available data transmission formats:</i> <ul style="list-style-type: none">• NMEA-0183 or NTL Binary for nav. data transmission and control;• RTCM 3.3 or Novatel OEMv7 for raw ranging data transmission. <i>Available baud rate diapason: 9600 to 460800.</i> <i>Default settings: 115200 Baud, 8 bits, no parity bit, 1 stop bit, no data.</i>

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