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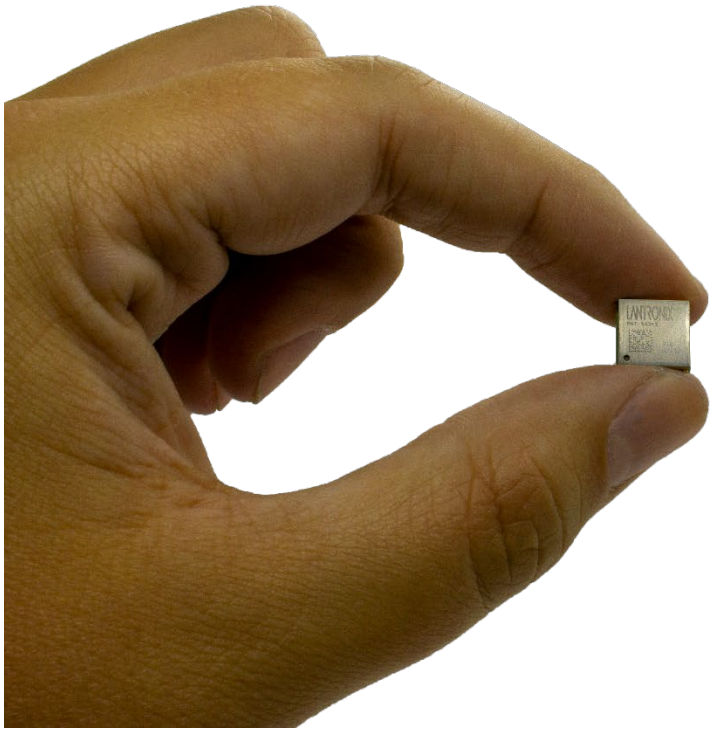


PNT-SG3FS GNSS Module
Datasheet

Part Number PDS-0021
Revision B October 2022

Table of Contents

List of Figures ____ 4
List of Tables ____ 5

1. Description 6

Overview ____ 6
Features ____ 6
GNSS Performance ____ 7
Block Diagram ____ 8
Pin Configuration ____ 8
Pin Out Description ____ 9

2. Supported GNSS Constellations 10

GPS ____ 10
GLONASS ____ 10
BeiDou ____ 10
Galileo ____ 10

3. Augmentation Systems 11

Satellite-Based Augmentation System ____ 11
QZSS ____ 11
Differential-GPS ____ 12

4. Assisted GNSS 13

Autonomous AGNSS ____ 13
Predictive AGNSS ____ 13
Real-Time AGNSS ____ 14

5. Clock Generation 15

Temperature-Compensated Crystal Oscillator (TCXO) ____ 15
Real-Time Clock (RTC) ____ 15

6. I/O Interfaces 16

UART ____ 16
I2C ____ 16

7. Firmware Update Support and Configuration 17

8. Power Mode 18

Hardware Off Standby 18
Hardware Standby 18
Software Standby 18

9. Timing 19

10. Data Logging 20

11. Geofencing 21

12. Odometer 22

13. Regulatory Compliance 23
Approvals 23

14. Electrical Characteristics 24
Parameter Conditions 24
Minimum and Maximum Values 24
Typical Values 24
Absolute Maximum Ratings 24
Recommended DC Operating Conditions 26

15. Mechanical Specifications 27

16. Shipping Information 28
Reels 28
Packing Cartons for Reels 31
ESD Handling Precautions 31
Moisture Sensitivity Levels 31

17. Labeling Information 32

18. Reflow Soldering Profile 33

19. Ordering Information 34
Warranty 34
Contact Information 34

List of Figures

Figure 1-1. Block Schematic _____ 8
Figure 1-2. Pin Layout _____ 8
Figure 15-1. Mechanical Specifications _____ 27
Figure 16-1. Carrier Type Specifications _____ 28
Figure 16-2. Orientation Specifications _____ 29
Figure 16-3. Cover Tape Specifications _____ 29
Figure 16-4. Plastic Reel Specifications _____ 30
Figure 16-5. PB Band Specifications _____ 30
Figure 17-1. Labeling Information _____ 32
Figure 18-1. Soldering Profile _____ 33

List of Tables

Table 1-1. GNSS Performance _____ 7
Table 1-2. Pin Out Description _____ 9
Table 3-1. Supported RTCM Messages _____ 12
Table 10-1. Datalog Type Description _____ 20
Table 14-1. Supply Voltage Characteristics when VCC_IO @ 1.8V _____ 24
Table 14-2. Supply Voltage Characteristics when VCC_IO @ 3.3V _____ 24
Table 14-3. Thermal Characteristics _____ 25
Table 14-4. Current Consumption _____ 25
Table 14-5 Recommended DC Operating Conditions _____ 26
Table 15-1. Mechanical Specifications Tolerance _____ 27
Table 17-1. Labeling Information Description _____ 32
Table 18-1. Soldering Profile Values _____ 33
Table 19-1. PNT-SG3FS Order Information _____ 34

1. Description

Overview

The PNT-SG3FS is a Global Navigation Satellite System (GNSS) standalone module with an integrated Teseo III receiver from ST Microelectronics. The multi-constellation receiver can track up to 32 satellite signals in view across GPS L1C/A, BeiDou B1, Galileo E1B/C, GLONASS L1OF, SBAS L1C/A (WAAS, EGNOS, MSAS, GAGAN), and QZSS L1C/A bands. The module supports Differential GPS (DGPS) data according to RTCM 10402.3. Assisted GNSS algorithms support extended ephemeris data using local autonomous or server-assisted based solutions for fast Time to First Fix (TTFF) operation.

The module can output measurement data (carrier phase) supporting RTK/PPP client algorithms for precise positioning applications.

The module supports 1.8V or 3.3V power supply domains and an embedded 16Mb flash memory that enables support for many features including data logging, geofencing, odometer, 5-day autonomous assisted GNSS, and firmware updates. The PNT-SG3FS module further integrates a temperature compensated crystal oscillator (TXCO) for navigation performance and stability, and a real-time clock (RTC) oscillator with a clock-trimming feature to compensate for the accuracy of the 32.768 kHz crystal in timing applications.

The PNT-SG3FS module is certified to Radio Equipment Directive (RED) 2014/53/EU, EN 62368-1:2020/A11:2020, EN 62479:2010, ETSI EN 301 489-1 V2.2.0 + ETSI EN 301 489-19 V2.1.0, and ETSI EN 303 413 V1.1.1.

Features

- Simultaneous multi-constellation
- -163 dBm tracking sensitivity
- 1.5 m CEP position accuracy (or <10 cm with external RTK/PPP client algorithms)
- Measurement data (carrier phase)
- 10 Hz receiver max fix rate DGPS and assisted GNSS
- Supports timing (accuracy of time pulse is ±12.4ns @ 99% measured using GPS + GLONASS)
- VCC/VBAT supply voltage when VCC_IO@1.8V: 1.8V or 3.3V
- VCC/VBAT supply voltage when VCC_IO@3.3V: 3.3V
- Tiny LCC 18-pin package (9.7 mm x 10.1 mm)
- UART and standard/fast/high speed slave I2C communication to host
- Operating temperature: -40° - 85°C
- Integrated switch mode power supply (SMPS)
- 9.5 µA standby current and 65 mW GPS tracking power consumption
- Modules delivered in cut-tape (50 pcs) and full reels (1000 pcs)

GNSS Performance

Table 1-1. GNSS Performance

Parameter	Specification	GPS and GLONASS	GPS and BeiDou	GPS and Galileo	Unit
Time To First Fix[1]	Cold start	< 32	< 36	< 30	s
	Warm start	< 25	< 29	< 26	
	Hot start	< 1.5	< 2.5	< 2	
Sensitivity[2, 3, 4, 5]	Tracking	-163	-163	-163	dBm
	Navigation[6]	-158	-158	-158	
	Reacquisition[7, 8]	-156	-156	-156	
	Cold start	-147	-147	-147	
	Warm start	-148	-148	-148	
	Hot start	-154	-151	-154	
Max fix rate	-	10	10	10	Hz
Velocity accuracy[9] (50% at 30 m/s - linear path)	-	0.01	-	0.01	m/s
Velocity accuracy[10] (50% at 0.5 g - shape path)	-	0.1	-	0.1	m/s
Heading accuracy (50% at 30 m/s - linear path)	-	0.01	-	0.01	°
Heading accuracy (50% at 0.5 g - shape path)	-	2.3	-	2.4	°
Horizontal position accuracy[11]	Autonomous	< 1.8	< 1.5	-	m
	SBAS	< 1.5	-	-	
Accuracy of time pulse	99%	± 12.4	± 29.09	± 21.8	ns
Frequency of time pulse	-	1	1	1	Hz
Operational limits[12]	Dynamic[13]	< 4.5g	< 4g	< 4.5g	
	Altitude[14]	18000	18000	18000	m
	Velocity	515	515	515	m/s

[1] All satellites at -130 dBm - TTFF at 50%.

[2] Demonstrated with a good external LNA.

[3] For hot start, all sats have the same signal level except one (pilot sat at -145 dBm).

[4] For BEIDOU tracking, sensitivity refers to MEO sats. For GEO the tracking sensitivity is -151 dBm.

[5] For GALILEO the signal level refers to both pilot and data components.

[6] Configurable value.

[7] All satellites at same signal level.

[8] Minimum level to get valid fix after reacquisition.

[9] 50% @ 30 m/s – linear path.

[10] 50% @ 0.5g – shape path.

[11] CEP 50%, 24h static, roof antenna.

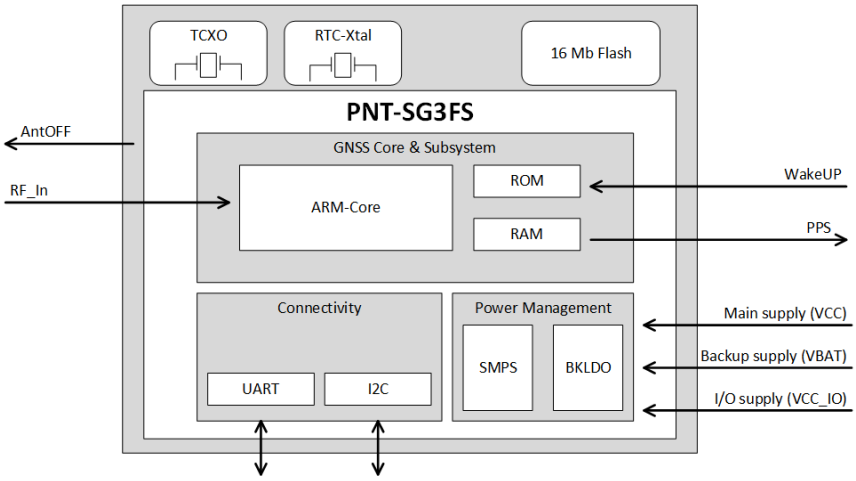
[12] Verified the limit checking the fix availability.

[13] Special configuration for high dynamic scenario.

[14] ITAR limits.

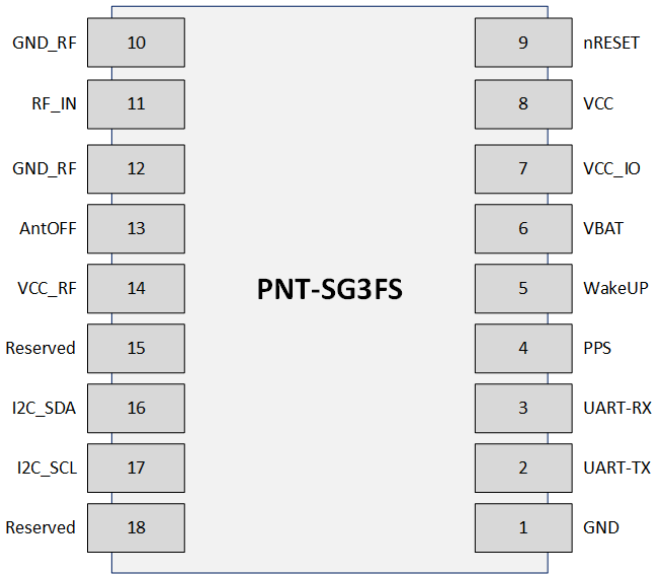
Block Diagram

Figure 1-1. Block Schematic



Pin Configuration

Figure 1-2. Pin Layout



Pin Out Description

Table 1-2. Pin Out Description

No	Name	I/O	Description
1	GND	Ground	Ground
2	UART-TX	O	Serial Port Tx (if not used, must be left floating)
3	UART-RX	I	Serial Port Rx
4	PPS	O	Time pulse (PPS) (if not used, must be left floating)
5	WakeUP	I	External Interrupt Pin (if not used, must be left floating)
6	VBAT	I	Backup voltage supply
7	VCC_IO	I	IO supply voltage (3.3V)
8	VCC	I	Supply voltage (from 2.1V to 4.2V)
9	nRESET	I	nRESET (if not used, must be left floating)
10	GND_RF	Ground	Ground
11	RF_IN	I	GNSS signal input
12	GND_RF	Ground	Ground
13	AntOFF	O	External Antenna Control (if not used, must be left floating)
14	VCC_RF	O	Output Voltage RF section (if not used, must be left floating)[1]
15	Reserved	-	Reserved (must be left floating)
16	I2C_SDA	I/O	I2C Data (if not used, must be left floating)
17	I2C_SCL	I/O	I2C Clock (if not used, must be left floating)
18	Reserved	-	Reserved (must be left floating)

[1] Can be used to supply external active antenna.

2. Supported GNSS Constellations

The embedded firmware supports all the global GNSS constellations (GPS, GLONASS, Galileo, BEIDOU) and the QZSS regional communication service (see Section 3.).

The user can select what the application needs by firmware configuration.

- GPS/Galileo: 1559 to 1610 MHz
- GPS L1: 1575.42 MHz
- Galileo E1: 1575.42 MHz
- GLONASS: 1592.9525 to 1610.485 MHz
- GLONASS G1: 1602 MHz to (n * 0.5625 MHz, n = -7, -6, -5, …, 0, …, 6)

GPS

The PNT-SG3FS GNSS module is designed to receive and to track the L1C/A signals provided at 1575.42 MHz by the Global Positioning System (GPS). The PNT-SG3FS can receive and process GPS concurrently with Galileo and GLONASS or BeiDou (the last two are mutually exclusive).

GLONASS

The PNT-SG3FS module can receive and process GLONASS concurrently with GPS and Galileo.

The Russian GLONASS satellite system (ГЛОНАСС; GLObal NAvigation Satellite System) is an alternative to US's GPS and EU's Galileo.

BeiDou

The PNT-SG3FS modules can receive and process BeiDou concurrently with GPS and Galileo. B1 signals provided at 1561.098 MHz by the BeiDou Navigation Satellite System can be tracked by PNT-SG3FS positioning modules. The ability to receive and track BeiDou B1 satellite signals with GPS results in higher coverage, improved reliability, and better accuracy especially in the difficult urban environment of cities like Shanghai, Taipei, and Singapore.

Galileo

The PNT-SG3FS can receive and process Galileo concurrently with GPS and GLONASS or BeiDou (the last two are mutually exclusive).

3. Augmentation Systems

Satellite-Based Augmentation System

The PNT-SG3FS supports SBAS, a Wide Area Differential GPS (WADGPS). SBAS is a system that provides differential GPS corrections data; SBAS includes the WAAS within the United States, the EGNOS within Europe, the Multifunctional Transport Satellite (MTSAT)–based MSAS within Japan and Southeast Asia, and the GPS and GEO Augmented Navigation (GAGAN) system in India.

SBAS data correction is used in the GNSS algorithm to provide a better position estimation. The overall SBAS differential correction mechanism can be conceived as built in 2 phases:

- The “Acquire and Tracking” phase
- The “Decoding” phase

The “Acquire and Track” phase relates to the capacity of the acquisition engine to reliably track the configured SBAS satellite; during the "Decoding" phase the SBAS message can be decoded to fetch the differential corrections.

The current longitude limits for each service are:

- WAAS: -180 to -25 degrees
- EGNOS: -25 degrees to +50 degrees
- GAGAN: +50 degrees to +100 degrees
- MSAS: +100 degrees to +180 degrees

The PNT-SG3FS software with SBAS capability implements a command interface at the NMEA level to allow interaction with the SBAS library. It supports commands to enable/disable the SBAS functionality.

QZSS

The Quasi-Zenith Satellite System (QZSS) is a Japanese regional communication services and positioning information for the mobile environment in the GPS L1C/A band. In conjunction with GPS signals, QZSS provides GNSS augmentation service for the Pacific region covering Japan and Australia. QZSS satellites are placed in a periodic Highly Elliptical Orbit (HEO): these orbits allow the satellites to “dwell” for more than 12 hours a day at an elevation above 70°, meaning they appear almost overhead most of the time.

Differential-GPS

The PNT-SG3FS supports Differential-GPS data according to RTCM (Radio Technical Commission for Maritime Services) 2.3. Differential-GPS data improves position accuracy.

The PNT-SG3FS supports the RTCM message types shown in Table 3-1 below.

Table 3-1. Supported RTCM Messages

Message Type	Description
1	Differential GPS Corrections
9	GPS Partial Correction Set
31	Differential GLONASS Corrections
34	GLONASS Partial Correction Set

4. Assisted GNSS

The PNT-SG3FS receiver needs accurate satellite position data from at least 4 satellites to produce a fix.

Accurate satellite data (ephemeris data) is valid for 4 hours for GPS and 30 minutes for GLONASS; after that time, a receiver must download new ephemeris data.

Ephemeris download can take from dozens of seconds to several minutes, hours, or can fail to download.

Assisted GNSS is a mechanism to provide ephemeris download assistance from an external source; this considerably reduces the time to produce a fix, especially in critical environments where the ephemeris download time could be very long.

The PNT-SG3FS supports three types of Assisted GNSS:

- Autonomous AGNSS using locally predicted ephemerides (up to 5 days of prediction)
- Predictive AGNSS using a networked assistance server (up to 14 days of prediction)
- Real-time AGNSS using a networked assistance server for a fast time to first fix (TTFF)

Autonomous AGNSS

Algorithms in the module can provide predicted ephemeris to the GNSS engine in less time than the normal time (about 30 seconds) needed to download real ephemeris from the sky. This considerably reduces the time to produce a fix, especially in critical environments where the ephemeris download time could be very long.

The algorithms work by using the real past ephemeris (downloaded from the sky and stored in its internal database) to extrapolate the parameter of future ephemeris (up to 5 days of prediction). The accuracy performance of Autonomous AGNSS (and Predictive AGNSS) is expected to decline over the predicted period. When the Autonomous AGNSS algorithms are enabled, the system automatically uploads the real ephemeris into its database as soon as new ephemeris are downloaded from the sky.

The module must operate in full power mode for at least 5 minutes to collect ephemeris data from visible satellites. Autonomous GNSS can take up to 12 hours to collect ephemeris data for a full constellation.

Refer to the PNT-SG3FS Software User Guide for additional information on the NMEA interface commands that enables/disables the functionality.

Predictive AGNSS

When used in systems with network data access, the assisted GNSS algorithm can leverage a networked assistance server to provide full-constellation prediction.

The Predictive AGNSS solution combines the advantage of a universal assistance data protocol with lightweight data access, needing only about 9 KB of biweekly data transfers to maintain fast and accurate GNSS performance.

From this downloaded payload called "seed", Predictive AGNSS is able to generate a satellite orbit forecast of up to 14 days.

The Assisted GNSS algorithm will seamlessly fall back from 14-days server-based forecast to 5-days self-sustaining, in-field forecast capability, depending on usage patterns. This is very useful

to maintain the quality of the GNSS experience should a connected device lose its ability to contact the server due to coverage or roaming issues, or any other wireless connectivity problem.

Refer to the PNT-SG3FS Software User Guide for additional information on the NMEA interface commands that enables/disables the functionality.

Real-Time AGNSS

The Real-Time Assisted GNSS (RT-AGNSS) solution provides a specific mix of assistance data elements over an HTTP transport protocol; therefore, it requires a network connection to download assistance data from the server.

RT-AGNSS works by downloading the assistance data elements – for example, the ephemerides and the almanacs data from an assistance server. The real-time data returned by the server must be promptly injected into the PNT-SG3FS memory using a few NMEA commands.

RT-AGNSS allows real-time satellite position determination in order to achieve a fix very quickly, if enough satellites are in view.

Refer to the PNT-SG3FS Software User Guide for additional information on the NMEA interface commands that enables/disables the functionality.

5. Clock Generation

Temperature-Compensated Crystal Oscillator (TCXO)

A highly stable oscillator controls the down conversion process in the RF block of the PNT-SG3FS. Characteristics of this component are important factors for higher sensitivity to maximize performances especially in weak-signal environments, as well as to minimize the Time To First Fix (TTFF) and provide better navigation stability.

Real-Time Clock (RTC)

This is an always-on power domain dedicated to RTC logic (backup system) and supplied with a dedicated voltage regulator.

The RTC provides a high-resolution clock. It keeps the time when the system is inactive, and it is internally used to wake up the system when in low-power mode. It has a clock trimming feature to compensate for the accuracy of the crystal in timing applications.

6. I/O Interfaces

The PNT-SG3FS supports the following I/O interfaces:

- UART port
- I2C port

NMEA protocol is supported on both UART and I2C ports.

UART

The Universal Asynchronous Receiver/Transmitter (UART) supports much of the functionality of the industry-standard 16C650 UART.

The UART performs serial-to-parallel conversion on data asynchronously received from a peripheral device on UART- RX pin, and parallel-to-serial conversion on data written by CPU for transmission on UART-TX pin. The transmit and receive paths are buffered with internal FIFO memories allowing up to 64 data bytes for transmission, and 64 data bytes with 4-bit status (break, frame, parity, and overrun) for receive.

I2C

The PNT-SG3FS includes a configurable I2C slave interface; I2C is a two-wire communication interface invented by Philips Semiconductor.

Unlike all other interfaces, I2C is not able to communicate in full-duplex mode; it uses only two bidirectional open-drain lines, Serial Data Line on pin I2C_SDA and Serial Clock Line on pin I2C_SCL, pulled up with resistors.

The PNT-SG3FS receiver always acts as slave and it cannot initiate data transmission on the bus; host has to periodically poll the receiver to check data availability.

The main features are:

- Normal speed (100 kHz) and Fast speed (400 kHz) supported
- I2C-slave address configurable using the firmware configurator

7. Firmware Update Support and Configuration

The PNT-SG3FS receiver module can be updated with new firmware releases.

All configuration parameters are grouped in a data block. Each field is addressed by a unique ID. The IDs consist of three digits: the most significant one represents the parameter type and the others are used to identify different parameters of the same type.

The default setting of a configuration data block is hard coded into the binary image file.

Detailed information is available in the PNT-SG3FS software user guide.

8. Power Mode

Standby mode is the mode where only low power backup domain is running. It means VBAT (pin 6) must be always maintained. It allows to have very low current consumption and fast GNSS reacquisition at the end of the standby time due to RTC.

PNT-SG3FS offers three different standby modes:

- Hardware OFF standby
- Hardware standby
- Software standby

Hardware Off Standby

This standby is ensured by switching OFF VCC (pin 8) and VCC_IO (pin 7) supplies and setting nRESET (pin 9) to GND. It can be activated asynchronously from GNSS firmware with one GPIO switching OFF power from a host.

During this standby only VBAT (pin 6) is kept ON.

During this standby mode VCC_RF (pin 14) is OFF.

Hardware Standby

This standby is ensured by switching ON VCC (pin 8), VBAT (pin 6), and VCC_IO (pin 7) and setting nRESET (pin 9) to GND.

During this standby mode VCC_RF (pin 14) is ON.

Ensure that VCC_RF is ON during this standby. In case of active antenna or external LNA, it is important to turn them both off.

Software Standby

Software standby is activated by the internal firmware.

Software standby can be:

- Host driven standby: where the host raises a NMEA commands to force PNT-SG3FS in standby; host can wake up PNT-SG3FS using WakeUP (pin 5);
- Periodic standby: where PNT-SG3FS enters and exits from standby using internal RTC. Periodic fixes are from 5 seconds up to 24 hours between 2 fixes.

Ensure that VCC_RF is ON during this standby. In case of active antenna or external LNA, it is important to turn them both off.

9. Timing

PNT-SG3FS receivers can be used to provide highly accurate time information. The PNT-SG3FS Timing module includes a specific Time Mode, which assumes a known antenna position and calculates a time pulse synchronized to either GPS /UTC(USNO) /GLONASS/UTC(SU).

The PNT-SG3FS provides an accurate one pulse-per-second.

10. Data Logging

Data logging allows the PNT-SG3FS receiver to locally save the resolved GNSS position to the flash in order to be retrieved on demand from the host.

PNT-SG3FS supports only one datalog at a time.

Datalogging can be enabled, disabled, and erased using proprietary NMEA runtime commands.

Datalogging subsystem supports both:

- Circular buffer
- Standard buffer

The recorded data is configurable; datalogging supports three types of data logged. Each type has a different size and different data logged. All the data logged types have timestamp, latitude and longitude while other fields depend by the type. See Table 10-1 below for details.

Table 10-1. Datalog Type Description

Type	Size	Altitude	Odometer	Geo	Quality	Qual_idx	Fix	Speed
1	12	-	-	X	-	X	X	-
2	16	X	-	X	X	-	X	X
3	30	X	X	X	X	-	X	X

PNT-SG3FS can support 12 hours logging using log-type 1 and fix rate at 1 Hz.

Detailed information is available in the PNT-SG3FS software user guide.

11. Geofencing

The Geofencing feature allows the PNT-SG3FS receiver to raise an autonomous NMEA message when the resolved GNSS position is close to a specific circle, entering or exiting from a circle.

The PNT-SG3FS receiver supports at least 8 circular areas where 4 circular areas are configurable in the firmware.

Geofencing alarm can be notified over proprietary NMEA message.

Geofencing can be configured and enabled in the firmware configurator or by using the specific geofencing configuration command.

Detailed information is available in the PNT-SG3FS software user guide.

12. Odometer

The PNT-SG3FS receiver supports an Odometer feature.

Odometer provides information on the traveled distance using only positioning information.

The Odometer can be configured using specific odometer commands during the runtime.

When enabled, the odometer reports the ground distance from the last reset.

The Odometer is also able to raise an autonomous message alarm when a programmed distance is reached.

Detailed information is available in the PNT-SG3FS software user guide.

13. Regulatory Compliance

Manufacturer's name and address:

Lantronix Inc.

48 Discovery, Suite 250

Irvine, CA 92618, USA

Declares that the following product:

Product Name(s): PNT-SG3FS GNSS Module

Conforms to the following standards or other normative documents:

- Radio Equipment Directive (RED) 2014/53/EU
- EN IEC 62368-1:2020/A11:2020
- ETSI EN 301 489-1 V2.2.3 and ETSI EN 301 489-19 V2.2.0
- ETSI EN 303 413 V1.2.1
- CE marking:

CE

Approvals

The PNT-SG3FS module is RoHS and WEEE compliant.

In countries belonging to the European Union, the PNT-SG3FS is subject to differentiated recycling at the end of its life cycle.

The PNT-SG3FS must not be disposed as undifferentiated waste or with other domestic waste.

The abandonment of this waste in the environment, in landfills, or in waste-to-energy plants results inthe pollution of soil, air, and water, with repercussions on human health.

14. Electrical Characteristics

Parameter Conditions

Unless otherwise specified, all voltages are referred to GND.

Minimum and Maximum Values

Unless otherwise specified, the minimum and maximum values are guaranteed in the worst conditions of ambient temperature, supply voltage and frequencies by tests in production on 100% of the devices with an ambient temperature at Tc = 25°C

Typical Values

Unless otherwise specified, typical data are based on Tc = 25 °C, VCC = 1.8 V, VCC_IO = 1.8V, and VBAT = 1.8V.

They are given only as design guidelines and are not tested.

Unless otherwise specified, all typical curves are given only as design guidelines and are not tested.

Absolute Maximum Ratings

This product contains devices to protect the inputs against damage due to high static voltages, however it is advisable to take normal precautions to avoid application of any voltage higher than the specified maximum rated voltages.

Table 14-1. Supply Voltage Characteristics when VCC_IO @ 1.8V

Symbol	Parameter	Min	Typ	Max	Unit
VCC	Digital supply voltage	1.755	1.8	4.2	V
VBAT	Backup input supply voltage	1.755	1.8	4.2	V
VCC_IO	IO supply voltage	1.755	-	1.98	V

Take care that VCC_IO is equal to or lower than VCC and VBAT.

Table 14-2. Supply Voltage Characteristics when VCC_IO @ 3.3V

Symbol	Parameter	Min	Typ	Max	Unit
VCC	Digital supply voltage	3.0	3.3	4.2	V
VBAT	Backup input supply voltage	3.0	3.3	4.2	V
VCC_IO	IO supply voltage	3.0	-	3.6	V

Take care that VCC_IO is equal to or lower than VCC and VBAT.

Table 14-3. Thermal Characteristics

Symbol	Parameter	Min	Max	Unit
Toper	Operative ambient temperature	-40	85	°C
Tstorage	Storage temperature	-40	85	°C

Table 14-4. Current Consumption

Symbol	Parameter	Test condition	Typ	Unit
Current consumption	Test condition GNSS tracking mode	GNSS = GPS only; T_c = 25 °C; VCC = VCC_IO = VBAT = 1.8 V	65	mW
		GNSS = GPS/Glonass; T_c = 25 °C; VCC = VCC_IO = VBAT = 1.8 V	80	mW
		GNSS = GPS/BeiDou; T_c = 25 °C; VCC = VCC_IO = VBAT = 1.8V	80	mW
		GNSS = GPS only; T_c = 25 °C; VCC = VCC_IO = VBAT = 3.3 V	95	mW
		GNSS = GPS/Glonass; T_c = 25 °C; VCC = VCC_IO = VBAT = 3.3 V	120	mW
		GNSS = GPS/BeiDou; T_c = 25 °C; VCC = VCC_IO = VBAT = 3.3V	115	mW
Current consumption (Standby)	HW-OFF mode	RTC running = 32.768 kHz; Tc = 25 °C; VCC = VCC_IO = nRESET = 0 V VCC_RF = 0V VBAT = ON	19 (VBAT = 1.8V) 17 (VBAT = 3.3V)	µA
	HW-STANDBY mode	RTC running = 32.768 kHz; Tc = 25 °C; VCC = VCC_IO = VBAT = 1.8 V nRESET = GND	19.5	µA
		RTC running = 32.768 kHz; Tc = 25 °C; VCC = VCC_IO = VBAT = 3.3 V nRESET = GND	20.5	µA
	SW-STANDBY mode	RTC running @ 32.768 kHz; Tc = 25 °C; VCC = VCC_IO = VBAT = 1.8V	9.5	µA
		RTC running @ 32.768 kHz; Tc = 25 °C; VCC = VCC_IO = VBAT = 3.3V	11	µA

Recommended DC Operating Conditions

Table 14-5 Recommended DC Operating Conditions

Symbol	Parameter	Min	Typ	Max	Unit
VCC	Power supply pins	1.755	1.8	1.98	V
VBAT	Power supply pins for backup internal logic	1.755	1.8	1.98	V
VCC_IO	I/O Supply Voltage	1.755	1.8	1.98	V

15. Mechanical Specifications

Figure 15-1. Mechanical Specifications

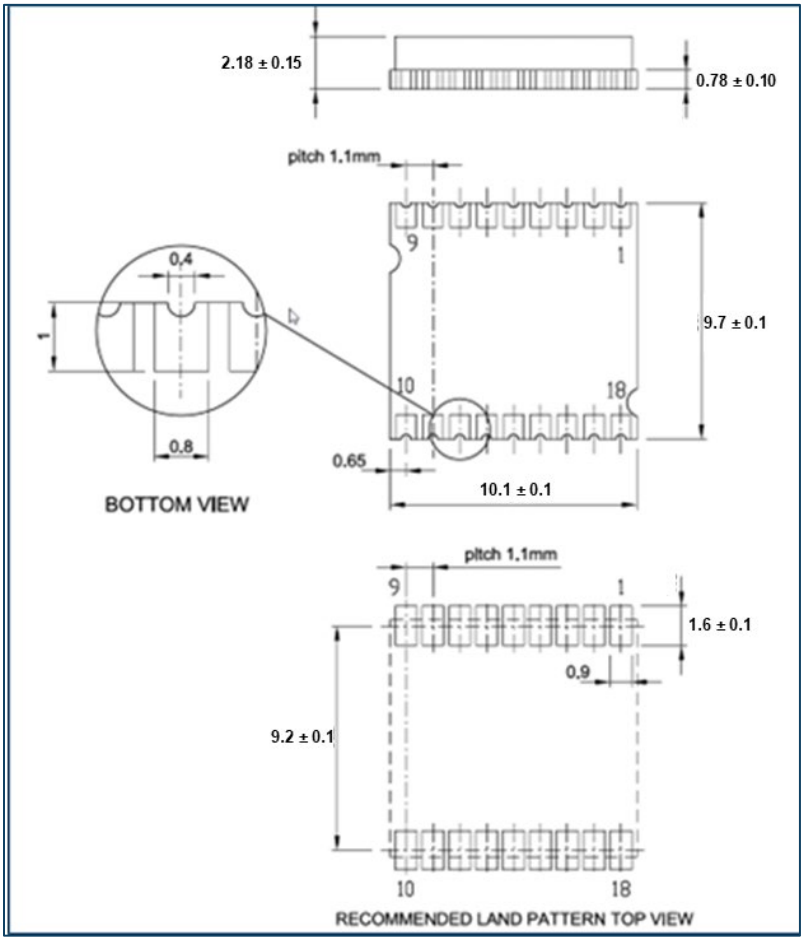


Table 15-1. Mechanical Specifications Tolerance

Linear Measures		Angle Measures	
No decimal	± 1 mm	No decimal	± 0.1°
.X	± 0.2 mm	.X	± 0.30°
.XX	± 0.1 mm	-	-
.XXX	± 0.05 mm	-	-
.XXXX	± 0.025 mm	-	-

16. Shipping Information

The PNT-SG3FS is delivered as reeled tapes.

For protection from physical damage, the reels are individually packed in cartons.

Reels

The PNT-SG3FS reel specification is as shown in the figures below.

Figure 16-1. Carrier Type Specifications

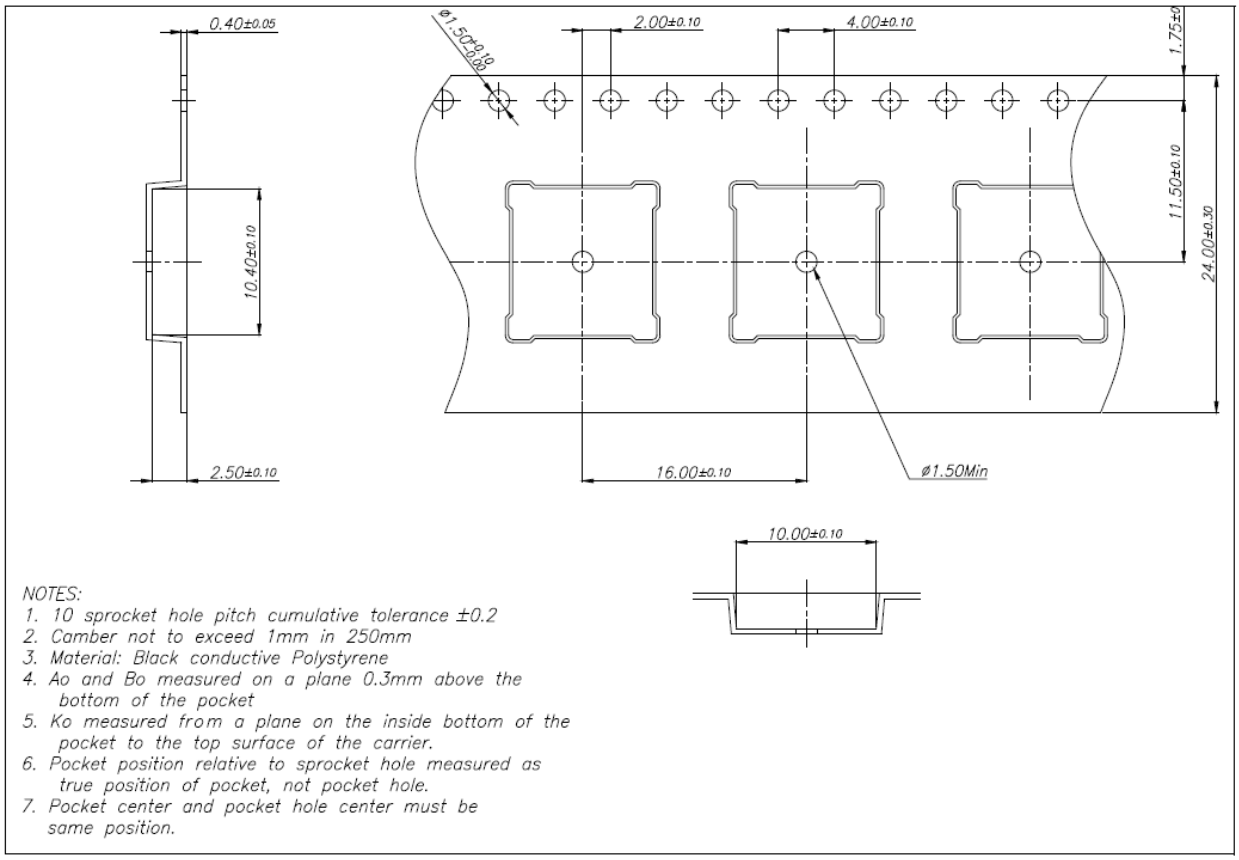


Figure 16-2. Orientation Specifications

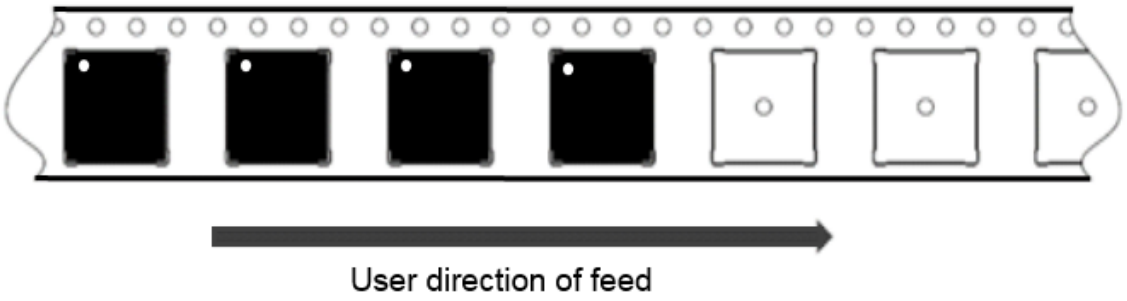


Figure 16-3. Cover Tape Specifications

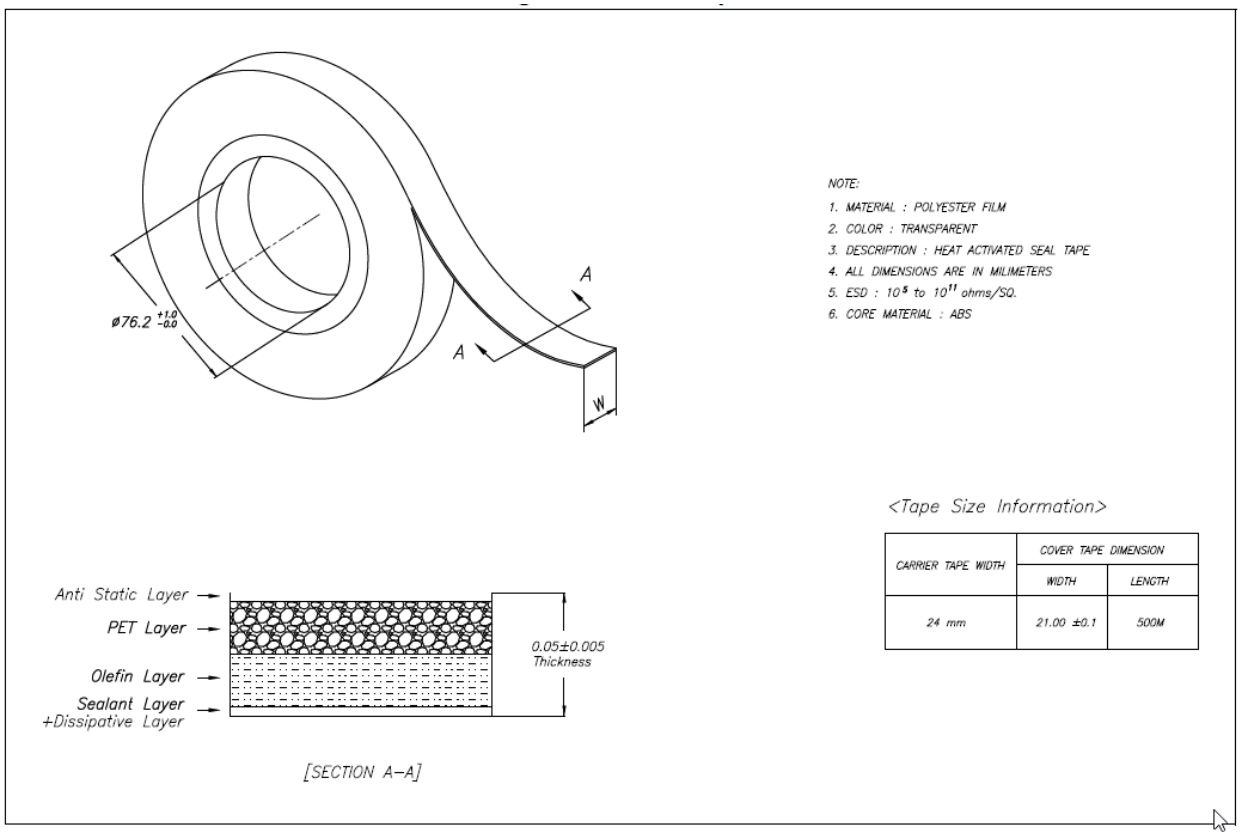
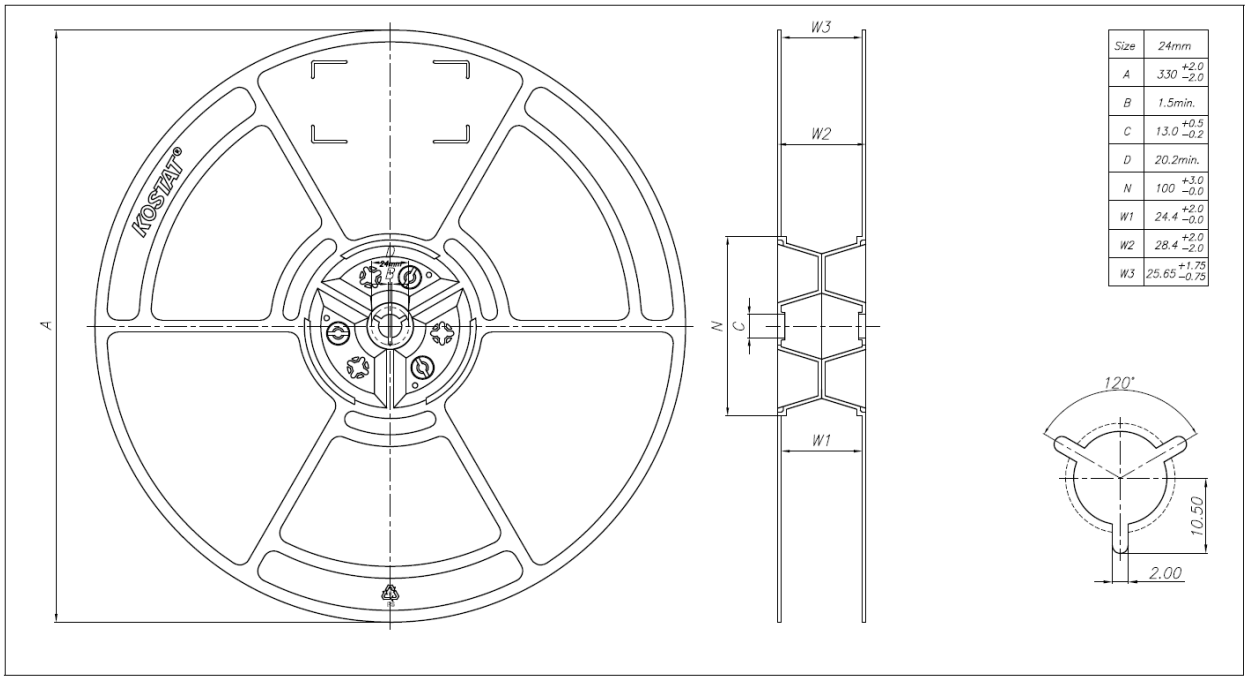
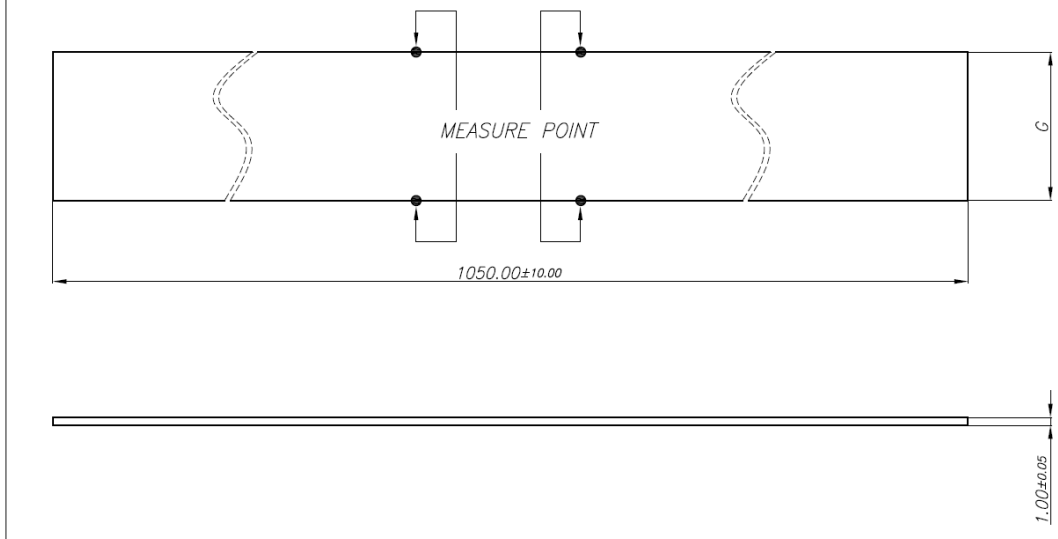


Figure 16-4. Plastic Reel Specifications



Size	24mm
A	330 +2.0 −2.0
B	1.5min.
C	13.0 +0.5 −0.2
D	20.2min.
N	100 +3.0 −0.0
W1	24.4 +2.0 −0.0
W2	28.4 +2.0 −2.0
W3	25.65 +1.75 −0.75

Figure 16-5. PB Band Specifications



UNIT : mm

WIDTH(mm)	12	16	24	32	44	56
G(±0.10)	12.20	16.20	24.20	32.20	44.20	56.20

Packing Cartons for Reels

To avoid damage, each PNT-SG3FS reel has a dedicated carton box of 340 x 340 x 38 mm.

ESD Handling Precautions

The PNT-SG3FS module is an Electrostatic Sensitive Devices (ESD). Observe precautions for handling! Failure to observe these precautions can result in severe damage to the GNSS receiver.

GNSS receivers are Electrostatic Sensitive Devices (ESD) and require special precautions when handling. Care must be exercised when handling patch antennas, due to the risk of electrostatic charges.

Moisture Sensitivity Levels

The Moisture Sensitivity Level (MSL) relates to the packaging and handling precautions required.

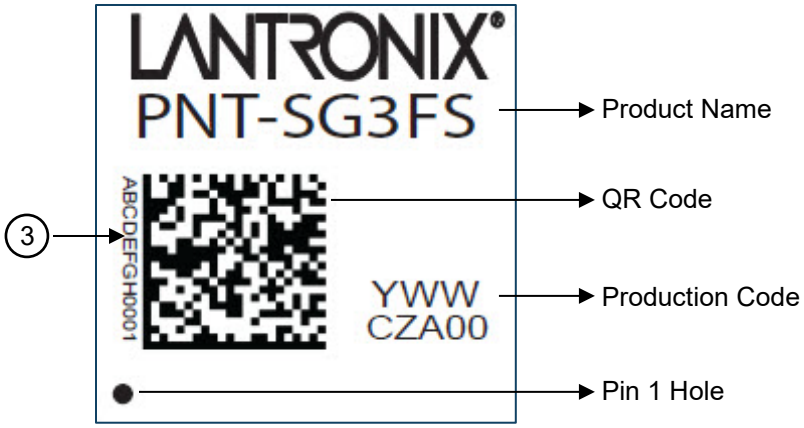
PNT-SG3FS modules are rated at MSL 3 (three).

17. Labeling Information

The labeling of the PNT-SG3FS reports product information.

Information layout of the PNT-SG3FS is shown in Figure 17-1 below.

Figure 17-1. Labeling Information



Information descriptions are shown in Table 17-1 below.

Table 17-1. Labeling Information Description

Items	Description
Product Name	Lantronix part number
QR Code	Code used for production traceability (Lantronix use only)
Production Code	Work week production date (YWW) and lot identifier
Pin 1 Hole	Hole on the shield to identify pin 1
③	(Optional) Alphanumeric tracking code for parts

18. Reflow Soldering Profile

The PNT-SG3FS is a high temperature strength surface mount GNSS module supplied on an 18 pin, 6-layer PCB. The final assembly recommended reflow profiles are indicated below.

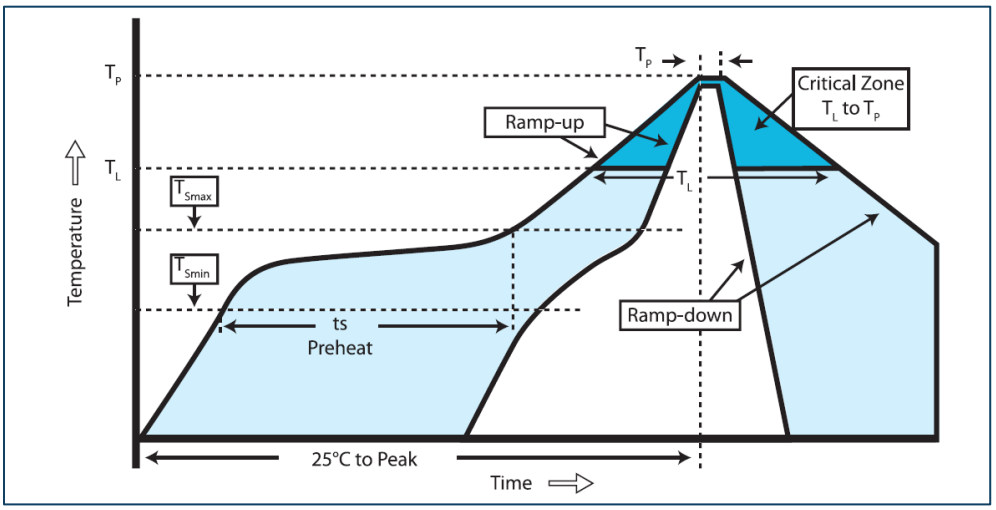
The soldering phase must be executed with care: in order to avoid undesired melting, particular attention must be taken on the set up of the peak temperature.

Table 18-1 and Figure 18-1 below provide suggestions for the temperature and soldering profiles.

Table 18-1. Soldering Profile Values

Profile feature	PB-free assembly
Average ramp-up rate (T_{SMAX} to T_P)	3 °C/sec max
Preheat: ○ Temperature min (T_{Smin}) ○ Temperature max (T_{Smax}) ○ Time (t_{Smin} to t_{Smax}) (t_S)	 150 °C 200 °C 60-100 sec
Time maintained above: ○ Temperature (T_L) ○ Time (t_L)	 217° C 60-70 sec
Peak temperature (T_P)	245 +/- 5 °C
Time within 5 °C of actual peak temperature (T_P)	10-20 sec
Ramp-down rate	6 °C/sec
Time from 25 °C to peak temperature	8 minutes max

Figure 18-1. Soldering Profile



19. Ordering Information

Table 19-1. PNT-SG3FS Order Information

Part Number	Description	
PNT-SG3FS-TR	GNSS Receiver - Low power Teseo flash-based GPS Galileo Glonass BeiDou QZSS Receiver	Tape and Reel (1000 units per reel)
PNT-SG3FS-CT	GNSS Receiver - Low power Teseo flash-based GPS Galileo Glonass BeiDou QZSS Receiver	Cut Tape in box (50 units per reel tape)

Warranty

The PNT-SG3FS comes with a 1-year warranty. For more details on the Lantronix warranty replacement policy, please go to our web site at www.lantronix.com/support/warranty.

Contact Information

For details contact your local Lantronix representative or Lantronix directly:

- Asia Pacific Region via e-mail at asiapacific_sales@lantronix.com
- Europe via e-mail at eu_sales@lantronix.com
- Japan via e-mail at japan_sales@lantronix.com
- United States via e-mail at sales@lantronix.com or call OEM sales support at 800-526-8764.

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PNT-SG3FS-CT PNT-SG3FS-TR