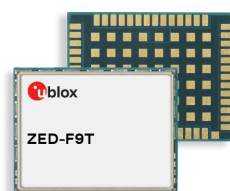


# ZED-F9T-20B

**High accuracy timing module**  
**Professional grade**

Data sheet



## Abstract

This data sheet describes the ZED-F9T timing module with multi-band GNSS receiver and nanosecond-level timing accuracy. ZED-F9T meets the most stringent 5G timing requirements, is ideal for global deployment due to GPS, BeiDou and Galileo reception, and is unaffected by ionospheric errors. The module provides differential timing mode for highly accurate local timing and built-in security for highest robustness against malicious attacks.

# Document information

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This document applies to the following products:

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ZED-F9T	ZED-F9T-20B-00	TIM 2.24	UBXDOC-963802114-13071	Engineering sample

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# 1 Functional description

## 1.1 Overview

ZED-F9T-20B is a multi-band GNSS module offering 5 ns (1-sigma) timing accuracy with unparalleled low power consumption.

ZED-F9T-20B incorporates the u-blox F9 multi-band platform in a small surface-mount device with a form factor of 22 x 17 mm.

## 1.2 Performance

Parameter	Specification	
Receiver type	Multi-band GNSS receiver for timing applications	
Accuracy of time pulse signal <sup>1 2</sup>	Absolute timing mode	5 ns
	Differential timing mode <sup>3</sup>	2.5 ns
Frequency of time pulse signal	0.25 Hz to 25 MHz (configurable)	
Time pulse jitter	±4 ns	
Time-mark resolution	8 ns	
Operational limits <sup>4</sup>	Dynamics	≤ 4 g
	Altitude	80,000 m
	Velocity	500 m/s
Velocity accuracy <sup>2 5</sup>	0.05 m/s	
Dynamic heading accuracy <sup>2 5</sup>	0.3 deg	

**Table 1: ZED-F9T-20B specifications**

GNSS		GPS+BDS+GAL	GPS+GAL	GPS+BDS	GPS
Acquisition <sup>6</sup>	Cold start	25 s	29 s	28 s	29 s
	Hot start	2 s	2 s	2 s	2 s
	Aided start <sup>7</sup>	2 s	2 s	2 s	2 s
Max navigation update rate <sup>8</sup>		10 Hz	15 Hz	12 Hz	20 Hz

**Table 2: ZED-F9T-20B performance in different GNSS modes**

<sup>1</sup> 1-sigma, fixed position mode, depends on temperature, atmospheric conditions, GNSS antenna, multipath conditions, satellite visibility and geometry

<sup>2</sup> Assumes typical performance of the navigation satellite systems.

<sup>3</sup> Depends on baseline length, demonstrated with 20 km baseline

<sup>4</sup> Assuming Airborne 4 g platform

<sup>5</sup> 50% at 30 m/s for dynamic operation

<sup>6</sup> Commanded starts. All satellites at -130 dBm. Measured at room temperature. Dual band operation

<sup>7</sup> Dependent on the speed and latency of the aiding data connection, commanded starts

<sup>8</sup> 95% In PVT navigation mode, assumes secondary navigation output disabled (default)

GNSS		GPS+BDS+GAL	GPS+GAL	GPS+BDS	GPS
Horizontal position accuracy (CEP) <sup>2</sup>	Standalone <sup>9</sup>	1.5 m	1.5 m	1.5 m	1.5 m

**Table 3: ZED-F9T-20B position accuracy in different GNSS modes**


In order to achieve the best absolute timing accuracy, measure the propagation delay of the entire signal path from the antenna to the receiver's time pulse output, and then compensate for this delay using the CFG-TP configuration items.

GNSS		GPS+GAL+BDS
Sensitivity <sup>10</sup>	Tracking and nav.	-167 dBm
	Reacquisition	-160 dBm
	Cold start	-148 dBm
	Hot start	-157 dBm

**Table 4: ZED-F9T-20B sensitivity**

### 1.3 Supported GNSS constellations

The ZED-F9T-20B GNSS module is a concurrent GNSS receiver that can receive and track multiple GNSS systems. Thanks to the multi-band RF front-end architecture, all major GNSS constellations (GPS, Galileo and BeiDou) as well as NavIC, SBAS, and QZSS satellites can be received concurrently. The ZED-F9T-20B can be configured to function as a L1, L2 or L1, L5 dual-band receiver. If low power consumption is a key factor, then the receiver can be configured for a subset of GNSS constellations.

ZED-F9T-20B can receive the NavIC L5 satellite signals that share the same frequency with GPS L5 signals and can be configured to work on its own or in parallel with the other GNSS constellations.

The QZSS system shares the same frequency bands with GPS and can only be processed in conjunction with GPS.

To benefit from multi-band signal reception, dedicated hardware preparation must be made during the design-in phase. See the Integration manual [1] for u-blox design recommendations.

ZED-F9T-20B supports the GNSS and their signals as shown in [Table 5](#).<sup>11</sup>

GPS / QZSS	Galileo	BeiDou	NavIC
L1C/A (1575.420 MHz)	E1-B/C (1575.420 MHz)	B1I (1561.098 MHz) B1C (1575.420 MHz)	-
L2C (1227.600 MHz)	E5b (1207.140 MHz)	B2I (1207.140 MHz)	-
L5 (1176.450 MHz)	E5a (1176.450 MHz)	B2a (1176.450 MHz)	SPS-L5 (1176.450 MHz)

**Table 5: Supported GNSS signals on ZED-F9T-20B**

ZED-F9T-20B can use the u-blox AssistNow™ Online service which provides GNSS assistance information.

<sup>9</sup> Depends on atmospheric conditions, GNSS antenna, multipath conditions, satellite visibility, and geometry


<sup>10</sup> Demonstrated with a good external LNA. Measured at room temperature.

<sup>11</sup> Only L1, L2 or L1, L5 bands are supported concurrently

## 1.4 Supported GNSS augmentation systems


### 1.4.1 Quasi-Zenith Satellite System (QZSS)

The Quasi-Zenith Satellite System (QZSS) is a regional navigation satellite system that provides positioning services for the Pacific region covering Japan and Australia. ZED-F9T-20B is able to receive and track QZSS L1 C/A and L5 signals concurrently with GPS signals, resulting in better availability especially under challenging signal conditions, e.g. in urban canyons.

 QZSS can be enabled only if the GPS operation is also configured.

### 1.4.2 Satellite-based augmentation system (SBAS)

ZED-F9T-20B supports SBAS (including WAAS in the US, EGNOS in Europe, L1Sb (QZSS SBAS) in Japan and GAGAN in India) to deliver improved location accuracy within the regions covered. However, the additional inter-standard time calibration step used during SBAS reception results in degraded time accuracy overall.

 SBAS reception is disabled by default in ZED-F9T-20B.

### 1.4.3 Differential timing mode

To improve timing accuracy locally, ZED-F9T-20B can be used in differential timing mode, in which correction data is sent to neighboring ZED-F9T-20B timing receivers via a communication network.

In differential timing mode ZED-F9T-20B can operate either as a reference station generating the following RTCM 3.3 messages, or as a corrected station using the following RTCM 3.3 messages:

Message type	Description
RTCM 1005	Stationary RTK reference station ARP
RTCM 1077	GPS MSM7
RTCM 1097	Galileo MSM7
RTCM 1127	BeiDou MSM7
RTCM 4072.1	Additional reference station information (u-blox proprietary RTCM Message)


**Table 6: Supported RTCM 3.3 messages**

## 1.5 Broadcast navigation data and satellite signal measurements

The ZED-F9T-20B can output all the GNSS broadcast data upon reception from tracked satellites. This includes all the supported GNSS signals as well as the QZSS and SBAS augmentation services. The UBX-RXM-SFRBX message provides this information. For the UBX-RXM-SFRBX message specification, see the Interface description [2]. The receiver can provide satellite signal information in a form compatible with the Radio Resource LCS Protocol (RRLP) [4].

### 1.5.1 Carrier-phase measurements

The ZED-F9T-20B modules provide raw carrier-phase data for all supported signals, along with pseudorange, Doppler and measurement quality information. The data contained in the UBX-RXM-RAWX message follows the conventions of a multi-GNSS RINEX 3 observation file. For the UBX-RXM-RAWX message specification, see Interface description [2].

 Raw measurement data is available once the receiver has established data bit synchronization and time-of-week.

## 1.6 Supported protocols

ZED-F9T-20B supports the following protocols:

Protocol	Type
UBX	Input/output, binary, u-blox proprietary
NMEA 4.11 (default), 4.10, 4.0, 2.3, and 2.1	Input/output, ASCII
RTCM 3.3	Input/output, binary

**Table 7: Supported protocols**

For specification of the protocols, see the Interface description [\[2\]](#).

## 2 System description

### 2.1 Block diagram

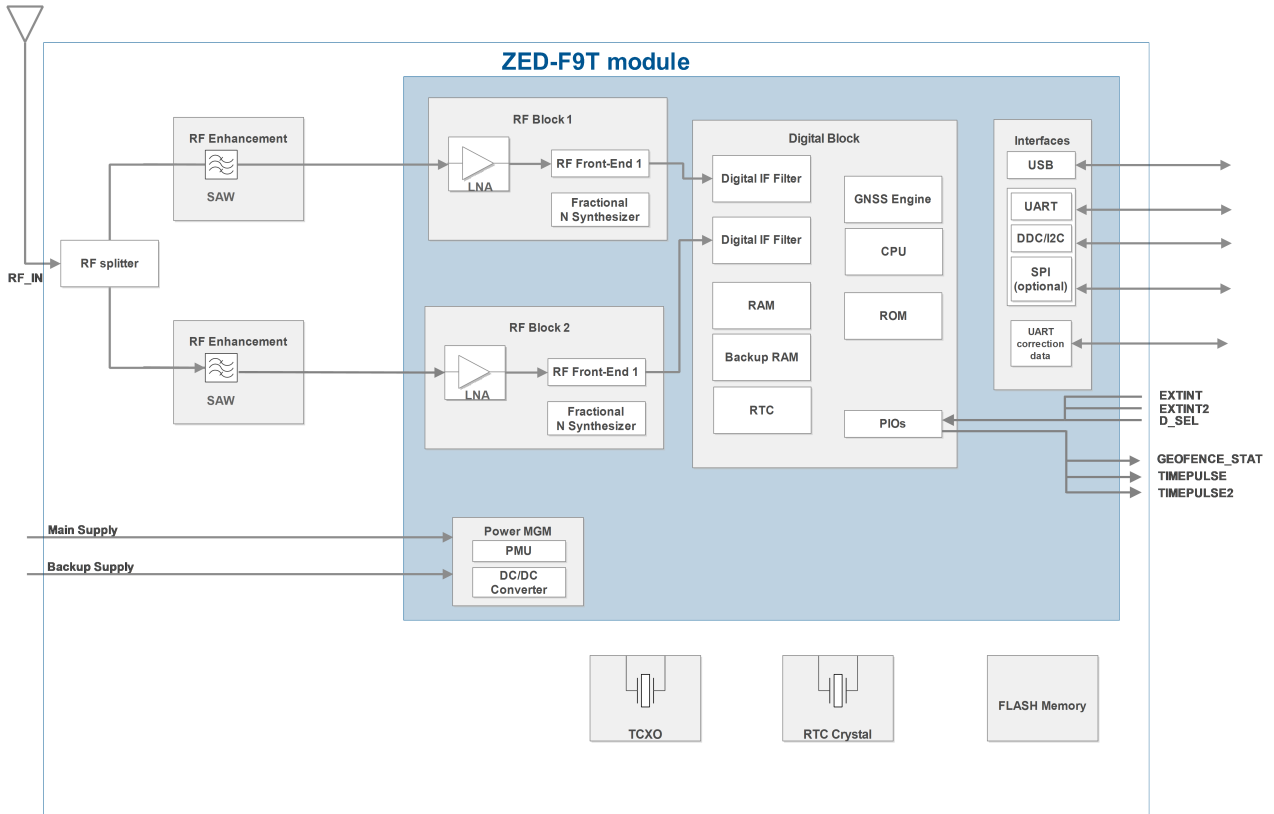


Figure 1: ZED-F9T-20B block diagram



An active antenna is mandatory with ZED-F9T-20B. For more information, see the Integration manual [1].



## 3 Pin definition

### 3.1 Pin assignment

The pin assignment of the ZED-F9T-20B module is shown in [Figure 2](#). The defined configuration of the PIOs is listed in [Table 8](#).

For detailed information on pin functions and characteristics, see the Integration manual [1].

ZED-F9T-20B is an LGA package with the I/O on the outside edge and central ground pads.

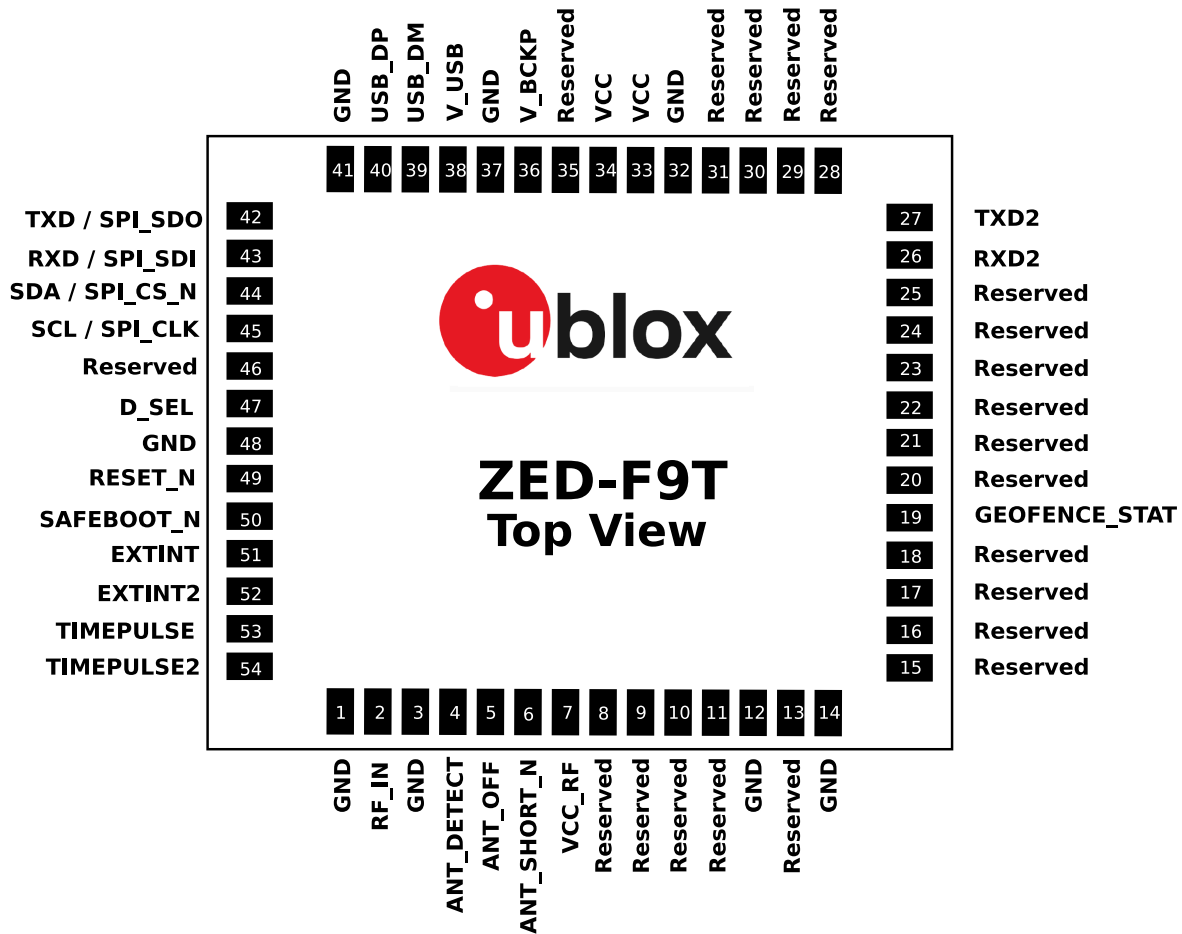


Figure 2: ZED-F9T-20B pin assignment

Pin no.	Name	I/O	Description
1	GND	-	Ground
2	RF_IN	I	RF input
3	GND	-	Ground
4	ANT_DETECT	I	Active antenna detect - default active high
5	ANT_OFF	O	External LNA disable - default active high
6	ANT_SHORT_N	I	Active antenna short detect - default active low
7	VCC_RF	O	Voltage for external LNA
8	Reserved	-	Reserved

Pin no.	Name	I/O	Description
9	Reserved	-	Reserved
10	Reserved	-	Reserved
11	Reserved	-	Reserved
12	GND	-	Ground
13	Reserved	-	Reserved
14	GND	-	Ground
15	Reserved	-	Reserved
16	Reserved	-	Reserved
17	Reserved	-	Reserved
18	Reserved	-	Reserved
19	GEOFENCE_STAT	O	Geofence status, user defined
20	Reserved	-	Reserved
21	Reserved	-	Reserved
22	Reserved	-	Reserved
23	Reserved	-	Reserved
24	Reserved	-	Reserved
25	Reserved	-	Reserved
26	RXD2	I	Correction UART input
27	TXD2	O	Correction UART output
28	Reserved	-	Reserved
29	Reserved	-	Reserved
30	Reserved	-	Reserved
31	Reserved	-	Reserved
32	GND	-	Ground
33	VCC	I	Voltage supply
34	VCC	I	Voltage supply
35	Reserved	-	Reserved
36	V_BCKP	I	Backup supply voltage
37	GND	-	Ground
38	V_USB	I	USB supply
39	USB_DM	I/O	USB data
40	USB_DP	I/O	USB data
41	GND	-	Ground
42	TXD / SPI_SDO	O	Host UART output if D_SEL = 1 (or open). SPI_SDO if D_SEL = 0
43	RXD / SPI_SDI	I	Host UART input if D_SEL = 1 (or open). SPI_SDI if D_SEL = 0
44	SDA / SPI_CS_N	I/O	I2C Data if D_SEL = 1 (or open). SPI Chip Select if D_SEL = 0
45	SCL / SPI_CLK	I/O	I2C Clock if D_SEL = 1 (or open). SPI Clock if D_SEL = 0
46	Reserved	-	Reserved
47	D_SEL	I	Interface select for pins 42-45
48	GND	-	Ground
49	RESET_N	I	RESET_N

Pin no.	Name	I/O	Description
50	SAFEBOOT_N	I	SAFEBOOT_N (If not used, leave open) <sup>12</sup>
51	EXTINT	I	External interrupt pin
52	EXTINT2	I	External interrupt pin 2
53	TIMEPULSE	O	Time pulse
54	TIMEPULSE2	O	Time pulse 2

**Table 8: ZED-F9T-20B pin assignment**

<sup>12</sup> The receiver enters safeboot mode if SAFEBOOT\_N pin is low at start up. The SAFEBOOT\_N pin is internally connected to TIMEPULSE2 pin through a 1 k $\Omega$  series resistor.

## 4 Electrical specifications

### 4.1 Absolute maximum ratings

- CAUTION. Risk of device damage. Exceeding the absolute maximum ratings may affect the lifetime and reliability of the device or permanently damage it. Do not exceed the absolute maximum ratings.
- This product is not protected against overvoltage or reversed voltages. Use appropriate protection to avoid device damage from voltage spikes exceeding the specified boundaries.

Parameter	Symbol	Condition	Min	Max	Units
Power supply voltage	VCC		-0.5	3.6	V
Voltage ramp on VCC <sup>13</sup>			20	8000	µs/V
Backup battery voltage	V_BCKP		-0.5	3.6	V
Voltage ramp on V_BCKP <sup>13</sup>			20		µs/V
Input pin voltage	V <sub>in</sub>	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			300	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	Pr <sub>fin</sub>	source impedance = 50 Ω, continuous wave		10	dBm
Storage temperature	T <sub>stg</sub>		-40	+85	°C

**Table 9: Absolute maximum ratings**

### 4.2 Operating conditions

- 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	
V_USB current	I_USB		2.0		mA	
Backup battery voltage	V_BCKP	1.65		3.6	V	
Backup battery current <sup>14, 15</sup>	I_BCKP		45		µA	V_BCKP = 3 V, VCC = 0 V
SW backup current <sup>15</sup>	I_SWBCKP		1.4		mA	
Input pin voltage range	V <sub>in</sub>	0		VCC	V	
Digital IO pin low level input voltage	V <sub>il</sub>			0.4	V	
Digital IO pin high level input voltage	V <sub>ih</sub>	0.8 * VCC			V	
Digital IO pin low level output voltage	V <sub>ol</sub>			0.4	V	I <sub>ol</sub> = 2 mA
TIMEPULSE						I <sub>ol</sub> = 4 mA

<sup>13</sup> Exceeding the ramp speed may permanently damage the device

<sup>14</sup> 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.

<sup>15</sup> The value has been characterized at 25 °C ambient temperature.

Parameter	Symbol	Min	Typical	Max	Units	Condition
Digital IO pin high level output voltage TIMEPULSE	Voh	VCC – 0.4			V	Ioh = 2 mA Ioh = 4 mA
DC current through any digital I/O pin (except supplies)	Ipin			5	mA	
Pull-up resistance for SCL, SDA	R <sub>pu</sub>	7	15	30	kΩ	
Pull-up resistance for D_SEL, RXD, TXD, SAFEBOOT_N, EXTINT	R <sub>pu</sub>	30	75	130	kΩ	
Pull-up resistance for RESET_N	R <sub>pu</sub>	7	10	13	kΩ	
VCC_RF voltage	VCC_RF		VCC – 0.1		V	
VCC_RF output current	ICC_RF			50	mA	
Receiver chain noise figure <sup>16</sup>	NF <sub>tot</sub>		9.5		dB	
External gain (at RF_IN)	Ext_gain	17		50	dB	
Operating temperature	Topr	–40	+25	+85	°C	

**Table 10: Operating conditions**

### 4.3 Indicative power requirements

Table 11 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.

All values in Table 11 have been measured at 25 °C ambient temperature.



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+GAL +BDS	GPS	Unit
I <sub>PEAK</sub>	Peak current	Acquisition	130	120	mA
I <sub>VCC</sub> <sup>17</sup>	VCC current	Acquisition	90	75	mA
I <sub>VCC</sub> <sup>17</sup>	VCC current	Tracking	85	70	mA

**Table 11: Currents to calculate the indicative power requirements**

<sup>16</sup> Only valid for GPS

<sup>17</sup> Simulated GNSS signal

## 5 Communications interfaces

ZED-F9T-20B 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 UART interfaces support configurable baud rates. For further information, see the Integration manual [1].

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	9600	921600	bit/s
$\Delta_{Tx}$	Tx baud rate accuracy	-1%	+1%	-
$\Delta_{Rx}$	Rx baud rate tolerance	-2.5%	+2.5%	-

Table 12: ZED-F9T-20B 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 peripheral 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 peripheral operation are defined in Figure 3. Default SPI configuration is CPOL = 0 and CPHA = 0.

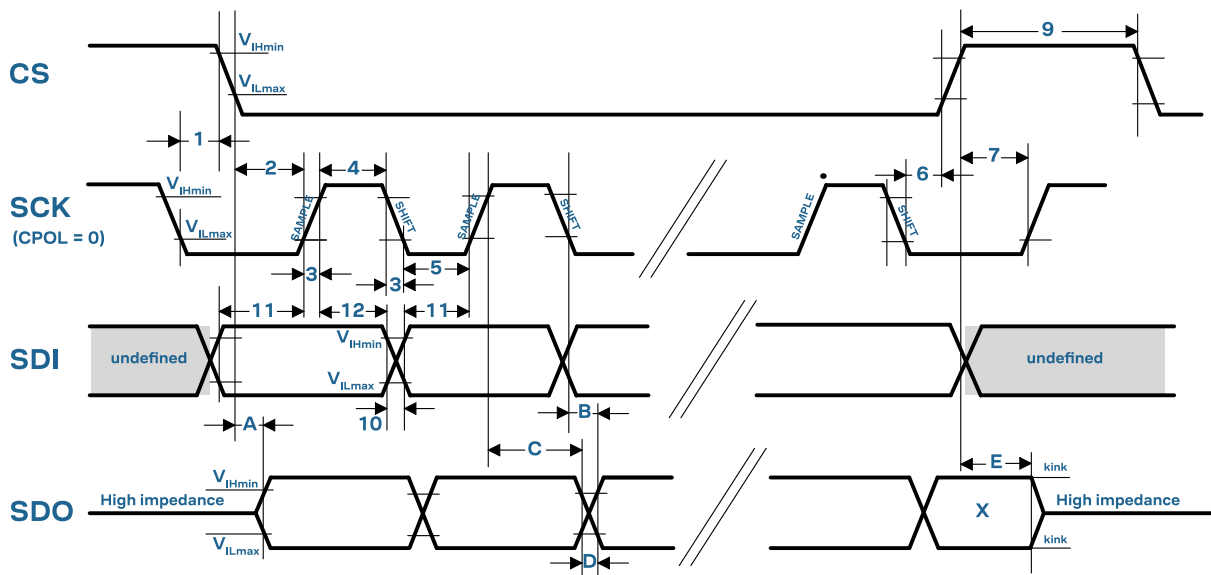


Figure 3: ZED-F9T-20B SPI specification mode 1: CPHA=0 SCK = 5.33 MHz

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

Symbol	Parameter	Min	Max	Unit
2	Chip 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	Chip deselect time (SCK falling to CS)	30	-	ns
7	Chip deselect time (CS to SCK)	30	-	ns
9	CS high time	32	-	ns
10	SDI transition time	-	7	ns
11	SDI setup time	16	-	ns
12	SDI hold time	24	-	ns

**Table 13: SPI peripheral input timing parameters 1 - 12**

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

**Table 14: SPI peripheral timing parameters A - E, 2 pF load capacitance**

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

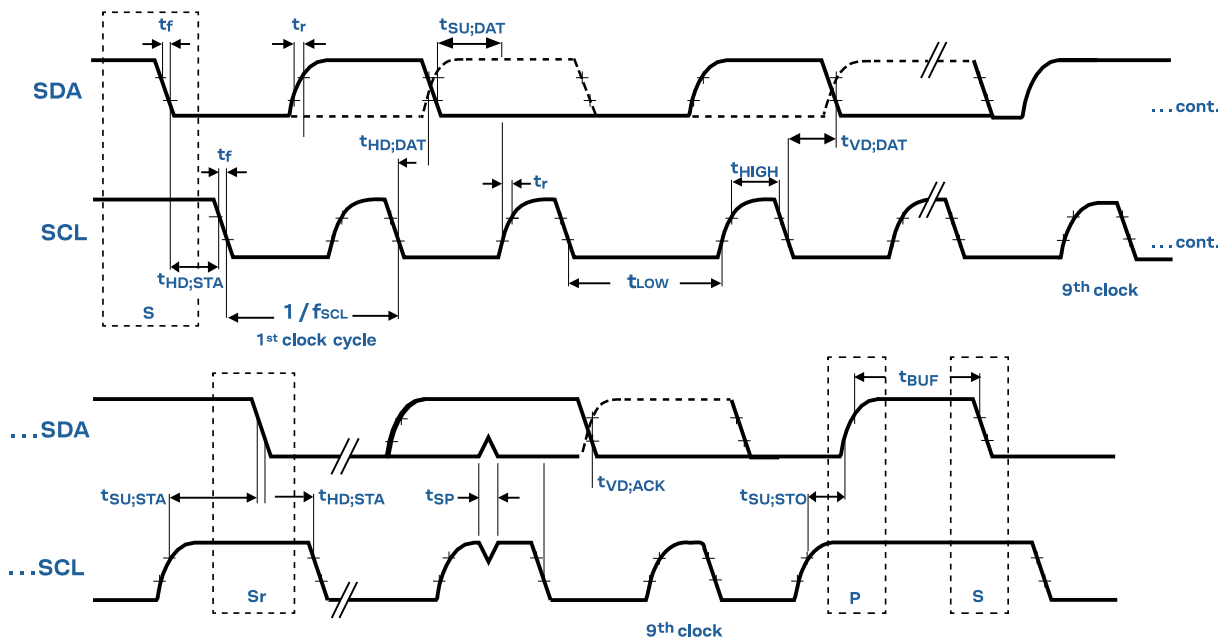
**Table 15: SPI peripheral timing parameters A - E, 20 pF load capacitance**

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

**Table 16: SPI peripheral 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 peripheral 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.



$$V_{IL} = 0.3 V_{DD}$$

$$V_{IH} = 0.7 V_{DD}$$

Figure 4: ZED-F9T-20B I2C peripheral specification

Symbol	Parameter	I2C Fast-mode		Unit
		Min	Max	
$f_{SCL}$	SCL clock frequency	0	400	kHz
$t_{HD;STA}$	Hold time (repeated) START condition	0.6	-	$\mu s$
$t_{LOW}$	Low period of the SCL clock	1.3	-	$\mu s$
$t_{HIGH}$	High period of the SCL clock	0.6	-	$\mu s$
$t_{SU;STA}$	Setup time for a repeated START condition	0.6	-	$\mu s$
$t_{HD;DAT}$	Data hold time	0 <sup>18</sup>	- <sup>19</sup>	$\mu s$
$t_{SU;DAT}$	Data setup time	100 <sup>20</sup>	-	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	-	$\mu s$
$t_{BUF}$	Bus-free time between a STOP and START condition	1.3	-	$\mu s$
$t_{VD;DAT}$	Data valid time	-	0.9 <sup>19</sup>	$\mu s$
$t_{VD;ACK}$	Data valid acknowledge time	-	0.9 <sup>19</sup>	$\mu s$
$V_{nL}$	Noise margin at the low level	0.1 VCC	-	V

<sup>18</sup> 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  $V_{ih}$  of the SCL signal) to bridge the undefined region of the falling edge of SCL.

<sup>19</sup> The maximum  $t_{HD;DAT}$  must be less than the maximum  $t_{VD;DAT}$  or  $t_{VD;ACK}$  with a maximum of 0.9  $\mu s$  by a transition time. This maximum must only be met if the device does not stretch the LOW period ( $t_{LOW}$ ) 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.

<sup>20</sup> When the I2C peripheral is stretching the clock, the  $t_{SU;DAT}$  of the first bit of the next byte is 62.5 ns.



Symbol	Parameter	I2C Fast-mode		Unit
		Min	Max	
V <sub>nH</sub>	Noise margin at the high level	0.2 VCC	-	V

**Table 17: ZED-F9T-20B I2C peripheral timings and specifications**


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
UART1 output	38400 baud, 8 bits, no parity bit, 1 stop bit. NMEA protocol with <b>GGA, GLL, GSA, GSV, RMC, VTG, TXT, ZDA</b> messages are output by default. UBX and RTCM 3.3 protocols are enabled by default but no output messages are enabled by default.
UART1 input	38400 baud, 8 bits, no parity bit, 1 stop bit. UBX, NMEA and RTCM 3.3 input protocols are enabled by default.
UART2 output	38400 baud, 8 bits, no parity bit, 1 stop bit. UBX protocol cannot be enabled. RTCM 3.3 protocol is enabled by default but no output messages are enabled by default. NMEA protocol is disabled by default.
UART2 input	38400 baud, 8 bits, no parity bit, 1 stop bit. UBX protocol cannot be enabled and will not receive UBX input messages. RTCM 3.3 protocol is enabled by default. NMEA protocol is disabled by default.
USB	Default messages activated as in UART1. Input/output protocols available as in UART1.
I2C	Available for communication in the Fast-mode with an external host CPU in peripheral mode only. Default messages activated as in UART1. Input/output protocols available as in UART1. Maximum bit rate 400 kb/s.
SPI	Allow communication to a host CPU, operated in peripheral mode only. Default messages activated as in UART1. Input/output protocols available as in UART1. SPI is not available unless D_SEL pin is set to low (see section D_SEL interface in Integration manual [1]).

**Table 18: Default interface settings**


Refer to the applicable Interface description [2] for information about further settings.



By default, ZED-F9T-20B outputs NMEA messages that include satellite data for all GNSS bands being received. This results in a high NMEA output load for each navigation period. Make sure the UART baud rate used is sufficient for the selected navigation rate and the number of GNSS signals being received.

## 6 Mechanical specifications

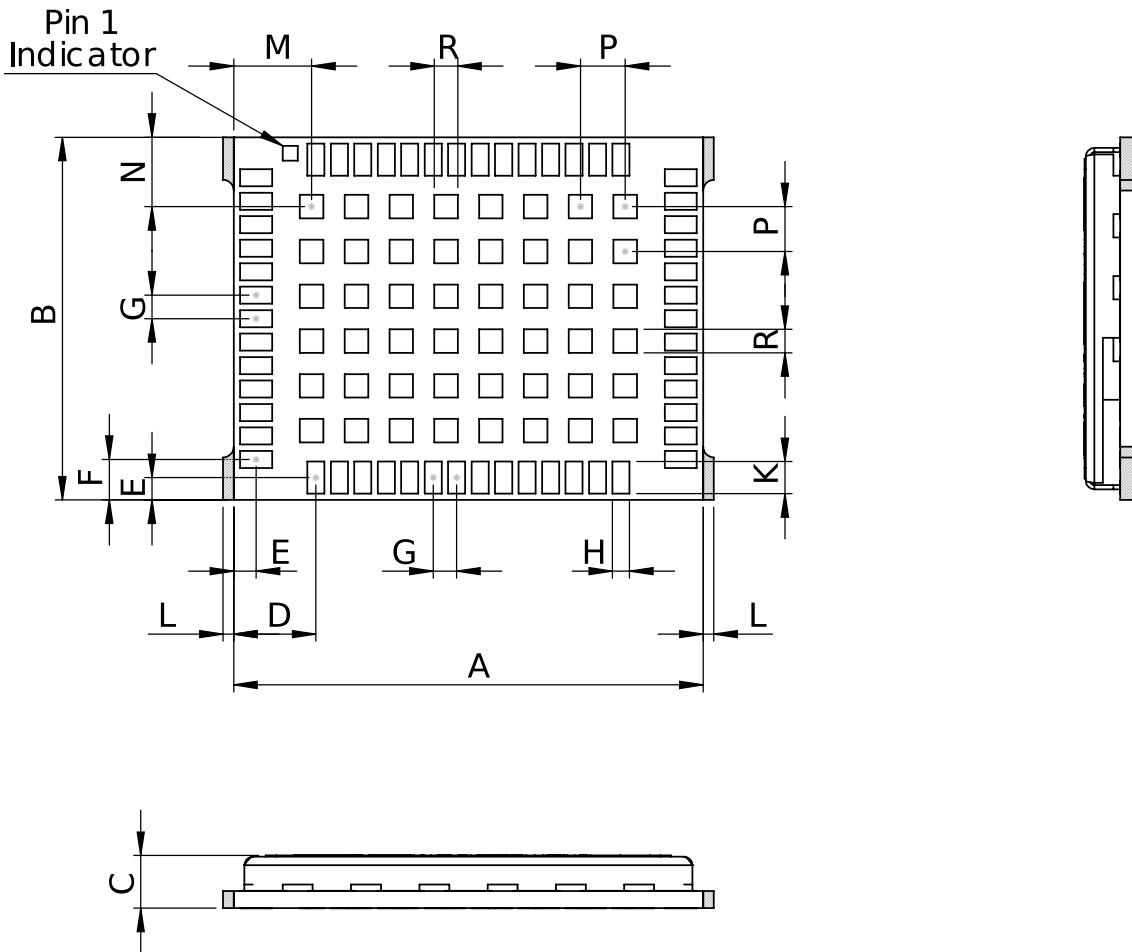


Figure 5: ZED-F9T-20B mechanical drawing

Symbol	Min (mm)	Typical (mm)	Max (mm)
A	21.80	22.00	22.20
B	16.80	17.00	17.20
C	2.20	2.40	2.60
D	3.65	3.85	4.05
E	0.85	1.05	1.25
F	1.70	1.90	2.10
G	1.05	1.10	1.15
H	0.70	0.80	0.96
K	1.20	1.50	1.80
M	3.45	3.65	3.85
N	3.05	3.25	3.45
P	2.05	2.10	2.15

Symbol	Min (mm)	Typical (mm)	Max (mm)
R	0.88	1.10	1.32
L	0.00		0.30
Weight		1.8 g	

**Table 19: ZED-F9T-20B mechanical dimensions**



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



Take the size of the de-paneling residual tabs into account when designing the component keep-out area.

## 7 Qualifications and approvals

<b>Quality and reliability</b>	
Product qualification	Qualified according to ISO 16750
Chip qualification	Modules are based on AEC-Q100 qualified GNSS chips
Manufacturing	Manufactured at ISO/TS 16949 certified sites
<b>Environmental</b>	
RoHS compliance	Yes
Moisture sensitivity level (MSL) <sup>21 22</sup>	4
<b>Type approvals</b>	
European RED certification (CE)	Declaration of Conformity (DoC) is available on the <a href="#">u-blox website</a> .
UK conformity assessment (UKCA)	Yes

**Table 20: Qualifications and approvals**

<sup>21</sup> For the MSL standard, see IPC/JEDEC J-STD-020 and J-STD-033, available on [www.jedec.org](http://www.jedec.org)

<sup>22</sup> For more information regarding moisture sensitivity levels, labelling, storage and drying, see the Product packaging reference guide [3]

## 8 Labeling and ordering information

This section provides information about product labels and ordering.

### 8.1 Product label

The product label provides information on ZED-F9T-20B and its revision, as in [Figure 6](#). For a description of the label, see [Table 21](#).

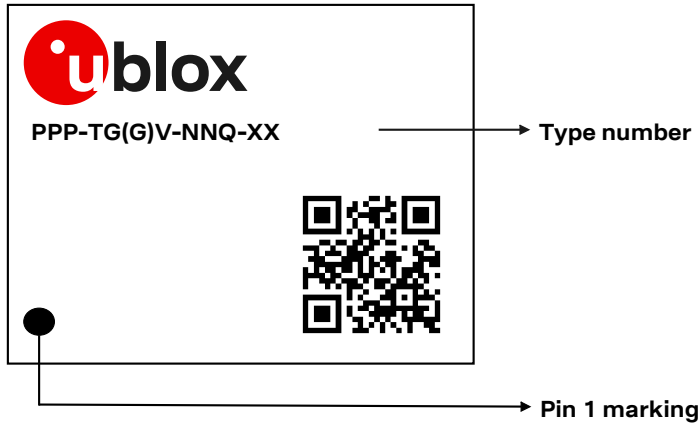


Figure 6: Example of ZED-F9T-20B label

Code	Meaning	Example
PPP	Form factor	ZED
TG(G)	Platform	F9 = u-blox F9
V	Variant	T = Timing
NN	Major product version	00, 01, ..., 99
Q	Product grade	A = Automotive, B = Professional, C= Standard
XX	Revision	Hardware and firmware revisions
	Production date	Year/week, e.g. 24/04 or 2404
	Serial number	
Other information	Data code, QR code	For internal/technical use

Table 21: Description of product label

### 8.2 Product identifiers

The ZED-F9T-20B label features three product identifiers: **product name**, **ordering code**, and **type number**. The product name identifies all u-blox products. It is used in documentation such as this Data sheet and is independent of packaging and product grade. The ordering code indicates the major product version and product grade, and the type number additionally specifies the hardware and firmware revisions.

[Table 22](#) describes the three different product identifiers used in the ZED-F9T-20B label

Identifier	Format	Example
Product name	PPP-TG(G)V	ZED-F9T
Ordering code	PPP-TG(G)V-NNQ	ZED-F9T-20B
Type number	PPP-TG(G)V-NNQ-XX	ZED-F9T-20B-00

Table 22: Product identifiers

### 8.3 Ordering codes

Ordering code	Product	Remark
ZED-F9T-20B	u-blox ZED-F9T	

Table 23: Product ordering codes

u-blox provides information on product changes affecting the form factor, size or function of the product. For the Product change notifications (PCNs), see our website at <https://www.u-blox.com/en/product-resources>.

## Related documents

- [1] ZED-F9T Integration manual, [UBX-21040375](#)
- [2] TIM 2.24 Interface description [UBXDOC-963802114-13046](#)
- [3] Product packaging reference guide, [UBX-14001652](#)
- [4] Radio Resource LCS Protocol (RRLP), (3GPP TS 44.031 version 11.0.0 Release 11)



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	Status / comments
R01	28-Aug-2024	Initial version
R02	23-Oct-2024	Updates: <ul style="list-style-type: none"><li>• Product status to engineering sample</li><li>• Firmware to TIM 2.24</li><li>• Added USB voltages and Pull-up resistance details in table Operating conditions</li></ul>



## Contact

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