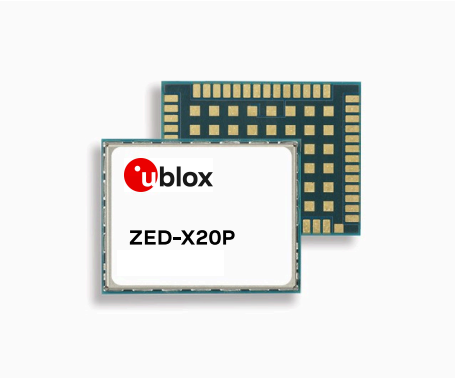
ZED-X20P

All-band high precision GNSS module

Professional grade

Data sheet



Abstract

This data sheet describes the ZED-X20P high precision module with all-band GNSS receiver. The module provides all-band RTK with fast convergence times, reliable performance and easy integration of RTK for fast time-to-market. It has a high update rate for highly dynamic applications and centimeter-level accuracy in a small and energy-efficient module.

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UBXDOC-963802114-12690 - R01
C2-Restricted

Document information

Title	**ZED-X20P**	
Subtitle	All-band high precision GNSS module	
Document type	Data sheet	
Document number	UBXDOC-963802114-12690	
Revision and date	R01	06-Sep-2024
Disclosure restriction	C2-Restricted	

Product status	Corresponding content status	
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
ZED-X20P	ZED-X20P-00B-00	HPG 2.00B01	N/A	In development / prototype

Contents

1 Functional description

1.1 Overview

ZED-X20P is an innovative all-band receiver module designed to revolutionize positioning technology in industrial applications. Built upon the u-blox new generation receiver platform, this module offers multi-band GNSS capability, supporting bands including L1, L2, L5, and L6. With its comprehensive coverage, ZED-X20P ensures precise and reliable positioning even in challenging environments, setting a new standard in accuracy.

Equipped with integrated u-blox multi-band real-time kinematic (RTK) and precise point positioning real-time kinematic (PPP-RTK) technologies, ZED-X20P achieves centimeter-level accuracy, enabling precise navigation and automation in industrial and consumer-grade products. Despite its advanced capabilities, ZED-X20P maintains a compact surface-mounted form factor, measuring only 17.0 x 22.0 x 2.4 mm, ensuring seamless integration into various applications without compromising performance.

In this document, RTK refers to an observation state representation (OSR) based solution utilizing radio technical commission for maritime services (RTCM) corrections, while PPP-RTK refers to state space representation (SSR) based solution using safe position augmentation for real-time navigation (SPARTN). With its comprehensive features and advanced technologies, ZED-X20P offers unparalleled accuracy and reliability, making it the ideal choice for applications requiring high-performance positioning solutions.

1.2 Performance

Parameter	Specification	Value
Receiver type		All-band GNSS high precision receiver
Accuracy of time pulse signal	RMS	20 ns
	99%	60 ns
Frequency of time pulse signal		Default 1PPS (0.25 Hz to 10 MHz configurable)
Operational limits [1]	Dynamics	≤ 4 g
	Altitude	80,000 m
	Velocity	500 m/s
Velocity accuracy [2]		0.05 m/s
Dynamic heading accuracy [2]		0.3 deg

Table 1: ZED-X20P specifications

GNSS[3]		**GPS+GAL+BDS**
Acquisition[4]	Cold start	27 s
	Hot start	2 s
	Aided start[5]	2 s

1 Assuming Airborne 4 g platform.

2 50% at 30 m/s for dynamic operation.

3 GPS used in combination with QZSS and SBAS

4 Commanded starts. All satellites at -130 dBm. Measured at room temperature. All band operation

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

GNSS[3]		GPS+GAL+BDS
Max navigation update rate[6]	RTK	25 Hz
	PVT	25 Hz
	RAW	25 Hz
Convergence time[7]	RTK	< 10 s

Table 2: ZED-X20P performance

GNSS		GPS+GAL+BDS
Horizontal position accuracy (CEP)	PVT[8]	1.2 m
	SBAS[8]	0.6 m
	RTK[9]	0.01 m + 1 ppm
Vertical position accuracy (Median)	PVT[8]	2.0 m
	SBAS[8]	1.0 m
	RTK[9]	0.01 m + 1 ppm

Table 3: ZED-X20P position accuracy

GNSS[3]		GPS+GAL+BDS
Horizontal position accuracy (CEP)	SPARTN	< 0.06 m
Vertical position accuracy (Median)	SPARTN	< 0.10 m
Convergence time[7]	SPARTN[10]	< 50 s

Table 4: ZED-X20P performance for PPP-RTK

GNSS[3]		GPS+GAL+BDS
Sensitivity[11]	Tracking and nav.	-167 dBm
	Reacquisition	-160 dBm
	Cold start	-148 dBm
	Hot start	-157 dBm

Table 5: ZED-X20P sensitivity

1.3 Supported GNSS constellations

The ZED-X20P is a concurrent GNSS receiver that can receive and track multiple GNSS constellations. Owing to the multi-band RF front-end architecture, all major GNSS constellations (GPS, Galileo and BeiDou) plus SBAS and QZSS satellites can be received concurrently on L1, L2, L5 and L6 bands.

If power consumption is a key factor, the receiver can be configured for a subset of GNSS constellations.

3 GPS used in combination with QZSS and SBAS

6 Measured with primary output only, secondary output disabled (default)

7 Depends on atmospheric conditions, baseline length, GNSS antenna, multipath conditions, satellite visibility and geometry

8 24 hours static

9 Measured using 1 km baseline and patch antennas with good ground planes. Does not account for possible antenna phase center offset errors. ppm limited to baselines up to 20 km.

10 Measured for IP data stream only with low-latency communication link

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

ZED-X20P can receive the NavIC L5 satellite signals that share the same frequency with GPS L5 signals and can be configured to work in parallel with the other GNSS constellations. All satellites in view can be processed to provide an RTK navigation solution when used with correction data.

To benefit from multi-band signal reception, dedicated hardware preparation must be made during the design-in phase. The default configuration on ZED-X20P is concurrent reception of GPS, Galileo and BeiDou with QZSS and SBAS enabled.

The following GNSS and their signals are supported:

System	Signals
GPS	L1C/A (1575.420 MHz), L2C (1227.600 MHz), L5 (1176.450 MHz)
Galileo	E1-B/C (1575.420 MHz), E5a (1176.450 MHz), E6 (1278.750 MHz)
BeiDou	B1I (1561.098 MHz), B1C (1575.420 MHz), B2a (1176.450 MHz), B3I (1268.520 MHz)
QZSS	L1C/A, L1C/B[12] (1575.420 MHz), L2C (1227.600 MHz), L5 (1176.450 MHz), L6 (1278.750 MHz)
NavIC	SPS-L5 (1176.450 MHz)

Table 6: Supported GNSS and signals on ZED-X20P

1.4 Supported Assisted GNSS (A-GNSS) services

The following GNSS assistance services are supported:

Service	Support
AssistNow™ Online	GPS L1C/A, Galileo E1, QZSS L1C/A, BeiDou B1I

Table 7: Supported Assisted GNSS (A-GNSS) services

1.5 Supported augmentation systems

The following augmentation systems are supported:

System	Support
SBAS	EGNOS, GAGAN, MSAS, WAAS and BDSBAS

Table 8: Supported augmentation systems

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

1.6 Differential GNSS (DGNSS)

When operating in RTK mode, RTCM version 3 messages are required and the module supports DGNSS according to RTCM 10403.4.

Operating as a rover, ZED-X20P can decode the following RTCM 3.4 messages:

Message type	Description
RTCM 1001	L1-only GPS RTK observables
RTCM 1002	Extended L1-only GPS RTK observables

[12] L1C/B is currently in development phase.

Message type	Description
RTCM 1003	L1/L2 GPS RTK observables
RTCM 1004	Extended L1/L2 GPS RTK observables
RTCM 1005	Stationary RTK reference station ARP
RTCM 1006	Stationary RTK reference station ARP with antenna height
RTCM 1007	Antenna descriptor
RTCM 1033	Receiver and antenna description
RTCM 1074	GPS MSM4
RTCM 1075	GPS MSM5
RTCM 1077	GPS MSM7
RTCM 1094	Galileo MSM4
RTCM 1095	Galileo MSM5
RTCM 1097	Galileo MSM7
RTCM 1124	BeiDou MSM4
RTCM 1125	BeiDou MSM5
RTCM 1127	BeiDou MSM7

Table 9: Supported input RTCM 3.4 messages

Operating as a base station, ZED-X20P can generate the following RTCM 3.4 output messages:

Message type	Description
RTCM 1005	Stationary RTK reference station ARP
RTCM 1074	GPS MSM4
RTCM 1077	GPS MSM7
RTCM 1094	Galileo MSM4
RTCM 1097	Galileo MSM7
RTCM 1124	BeiDou MSM4
RTCM 1127	BeiDou MSM7
RTCM 4072.0	Reference station PVT (u-blox proprietary RTCM Message)

Table 10: Supported output RTCM 3.4 messages

Operating as a rover, ZED-X20P can decode the following SPARTN 2.0.1 messages:

Message type-subtype	Description
SM 0-0	GPS orbit, clock, bias (OCB)
SM 0-2	Galileo orbit, clock, bias (OCB)
SM 0-3	BeiDou orbit, clock, bias (OCB)
SM 1-0	GPS high-precision atmosphere correction (HPAC)
SM 1-2	Galileo high-precision atmosphere correction (HPAC)
SM 1-3	BeiDou high-precision atmosphere correction (HPAC)
SM 2-0	Geographic area definition (GAD)

Table 11: Supported input SPARTN version 2.0.1 messages

1.7 Supported protocols

ZED-X20P supports the following protocols:

Protocol	Type
UBX	Input/output, binary, u-blox proprietary

Protocol	Type
NMEA 4.11 (default), 4.10 and 4.0	Input/output, ASCII
RTCM 3.4	Input/output, binary
SPARTN	Input, binary

Table 12: Supported protocols

For specification of the protocols, see the Interface description [2].

1.8 Firmware features

Feature	Description
Antenna supervisor[13]	Antenna supervisor for active antenna control and short circuit detection
RAW data	Provides tracked satellite signal observables
Assisted GNSS	AssistNow Online
Backup modes	Hardware backup mode and software standby mode

Table 13: Firmware features

Feature	Description
Anti-jamming	RF interference and jamming detection and reporting
Anti-spoofing	Spoofing detection and reporting
Configuration lockdown	Receiver configuration can be locked by command
Secure boot	Only signed firmware images are executed

Table 14: Security features

1.9 Broadcast navigation data and satellite signal measurements

ZED-X20P uses UBX-RXM-SFRBX message to 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. See the Interface description[2] for the UBX-RXM-SFRBX message specification. The receiver can provide satellite signal information in a form compatible with the Radio Resource LCS Protocol (RRLP).

1.9.1 Carrier-phase measurements

The ZED-X20P provides 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.

[13] External components required, some pins need to be reconfigured.

2 Block diagram

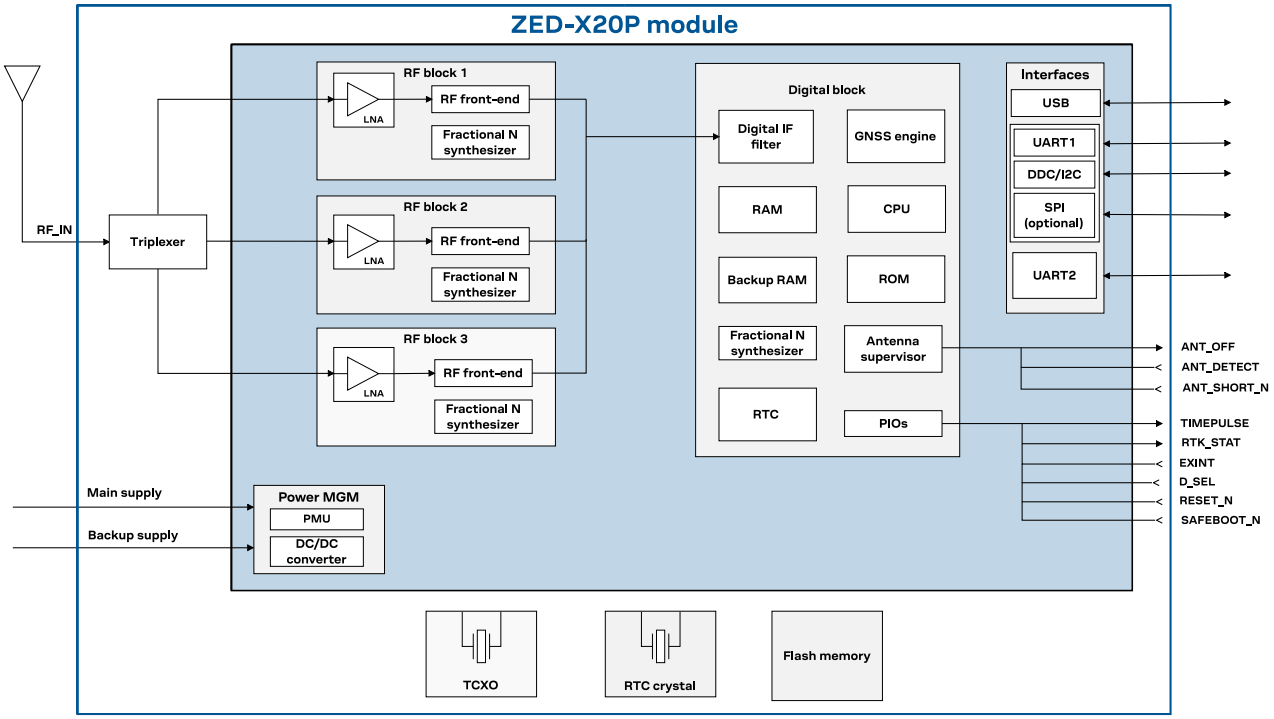


Figure 1: ZED-X20P block diagram

3 Pin definition

3.1 Pin assignment

The pin assignment of the ZED-X20P module is shown in Figure 2. The defined configuration of the PIOs is listed in Table 15.

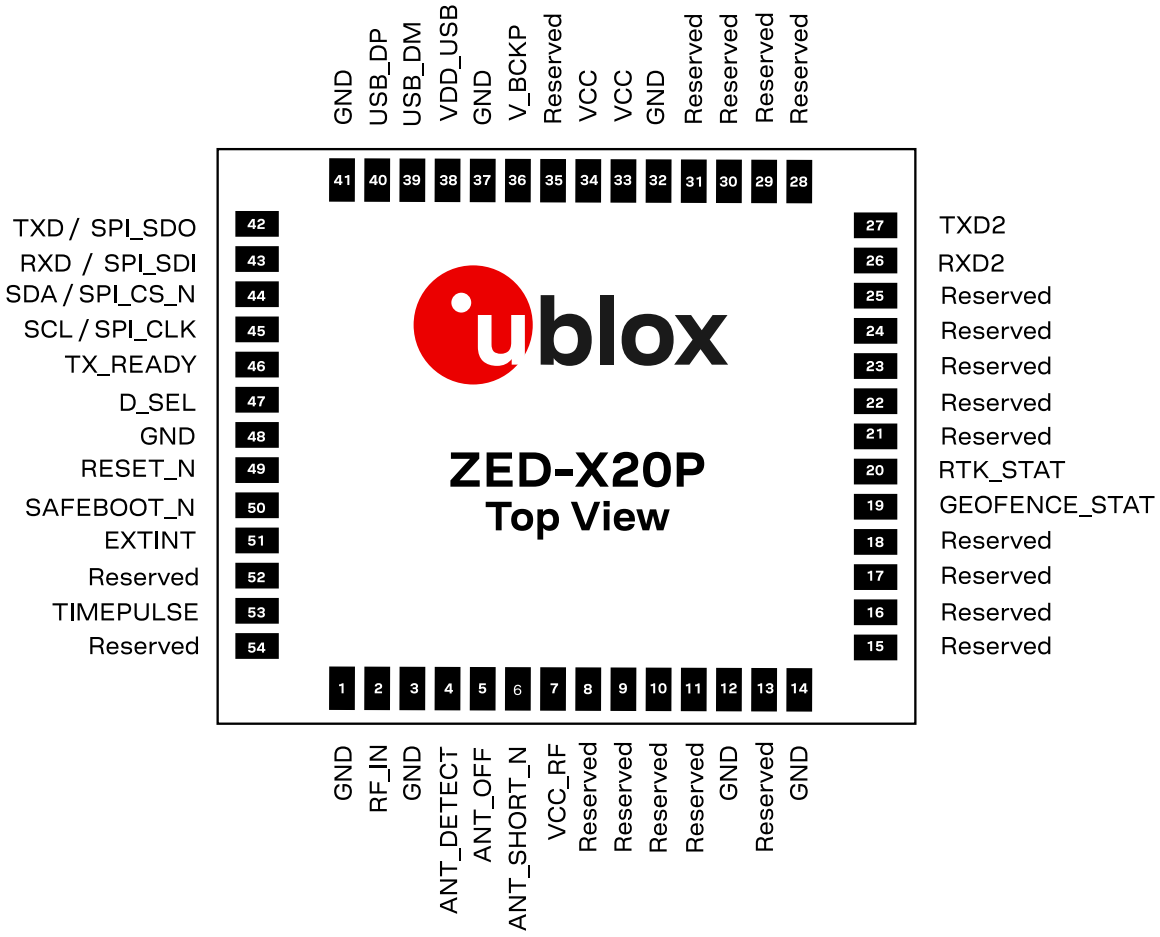


Figure 2: ZED-X20P pin assignment

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
9	Reserved	-	Reserved
10	Reserved	-	Reserved

Pin no.	Name	I/O	Description
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	RTK_STAT	O	RTK status: 0 = RTK/PPP-RTK fixed blinking = receiving and using corrections 1 = no corrections
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	VDD_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	TX_READY	O	TX_Buffer full and ready for TX of data
47	D_SEL	I	Interface select for pins 42-45
48	GND	-	Ground
49	RESET_N	I	RESET_N
50	SAFEBOOT_N	I	SAFEBOOT_N (for future service, updates and reconfiguration, leave OPEN)
51	EXTINT	I	External interrupt pin

Pin no.	Name	I/O	Description
52	Reserved	-	Reserved
53	TIMEPULSE	O	Time pulse
54	Reserved	-	Reserved

Table 15: ZED-X20P pin assignment

3.2 Pin state

Table 16 defines the state of the PIOs and RESET_N pins in different modes. The functions of the PIOs are as defined in the default configuration.

Pin no.	Default function	Continuous mode	Software standby mode	Safe boot mode
47	D_SEL = open	Input pull-up	Input pull-up	Input pull-up
	D_SEL = GND	High-Z	Input pull-down	High-Z
43	RXD	Input pull-up	Input pull-up	Input pull-up
	SPI_SDO	High-Z	Input pull-up	Input pull-up
42	TXD	Output	Input pull-up	Output
	SPI_SDI	Output[14]	Input pull-up	Output[14]
44	SDA	Input pull-up / Output	Input pull-up	Input pull-up / Output
	SPI_CS_N	High-Z	High-Z	High-Z
45	SCL	Input pull-up	Input pull-up	Input pull-up
	SPI_SLK	High-Z	High-Z	High-Z
53	TIMEPULSE	Output	Input pull-up	Output low
50	SAFEBOOT_N	Input pull-up	Input pull-up	Input pull-up
51	EXTINT	Input pull-up	Input pull-up	Input pull-up
26	RXD2	Input pull-up	Input pull-up	Input pull-up
27	TXD2	Output	Input pull-up	Output
49	RESET_N	Input pull-up	Input pull-up	Input pull-up

Table 16: Pins state

☞ In reset mode (RESET_N = low), all PIOs are configured as input pull-up.

☞ In hardware backup mode (VCC = 0 V), PIOs must not be driven.

[14] If SPI CS = low. Otherwise it is configured as an input pull-up.

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.

CAUTION. 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[15]			20	8000	µs/V
Backup battery voltage	V_BCKP		-0.5	3.6	V
Voltage ramp on V_BCKP[15]			20		µs/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			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	Prfin	source impedance = 50 Ω, continuous wave		10	dBm
Storage temperature	Tstg		-40	+85	°C

Table 17: 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	Condition	Min	Typical	Max	Units
Power supply voltage	VCC		2.7	3.0	3.6	V
Backup battery voltage	V_BCKP		1.65		3.6	V
Backup battery current[16,]	I_BCKP			32		µA
SW backup current	I_SWBCKP			93		µA
Input pin voltage range	Vin		0		VCC	V
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	Iol = 2 mA[18]			0.4	V
Digital IO pin high level output voltage	Voh	Ioh = 2 mA[18]	VCC – 0.4			V

15 Exceeding the ramp speed may permanently damage the device

16 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.

17 The value has been characterized at 25 °C ambient temperature.

18 TIMEPULSE has 4 mA current drive/sink capability

Parameter	Symbol	Condition	Min	Typical	Max	Units
DC current through any digital I/O pin (except supplies)	Ipin				5	mA
Pull-down resistors on GPIOs	R_{pd}		34	62	142	kΩ
Pull-up resistance for SCL, SDA, EXTINT	R_{pu}		8	16	40	kΩ
Pull-up resistance for D_SEL, RXD, TXD, SAFEBOOT_N	R_{pu}		35	67	205	kΩ
Pull-up resistance for RESET_N	R_{pu}		7	10	13	kΩ
Supply voltage USB	V_USB		1.68		3.6	V
Supply current USB	I_USB			1.5	25	mA
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	NFtot			6.5		dB
External gain (at RF_IN)	Ext_gain		17		50	dB
Operating temperature	Topr		–40	+25	+105	°C

Table 18: Operating conditions

4.3 Indicative power requirements

Table 19 provides examples of typical current requirements. The given values are total system supply current for a possible application including RF and baseband sections. The values 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_{PEAK}	Peak current	Acquisition	85	65	mA
I_{VCC}	VCC current	Acquisition	75	50	mA
I_{VCC}	VCC current	Tracking	70	50	mA

Table 19: Currents to calculate the indicative power requirements

5 Communications interfaces

The ZED-X20P receiver support communication over 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 V_IO, therefore all the voltage levels of the PIO pins are related to V_IO supply voltage.

5.1 UART

The UART interfaces support configurable baud rates. 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	8000000	bit/s
Δ_{Tx}	Tx baud rate accuracy	-1%	+1%	-
Δ_{Rx}	Rx baud rate tolerance	-2.5%	+2.5%	-

Table 20: ZED-X20P UART specifications

5.2 SPI

The SPI interface is disabled by default. The SPI interface shares pins with UART1 and I2C and can be selected by setting D_SEL = 0. The SPI interface can be operated in peripheral mode only. The SPI transfer rate based on load capacitance is shown in Table 21.

Load capacitance (pF)	Min transfer rate (kB/s)	Max transfer rate (kB/s)	Max clock frequency (MHz)
2	880	950	12.80
20	770	920	10.20
60	620	880	7.25

Table 21: SPI transfer rate based on load capacitance for ZED-X20P

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

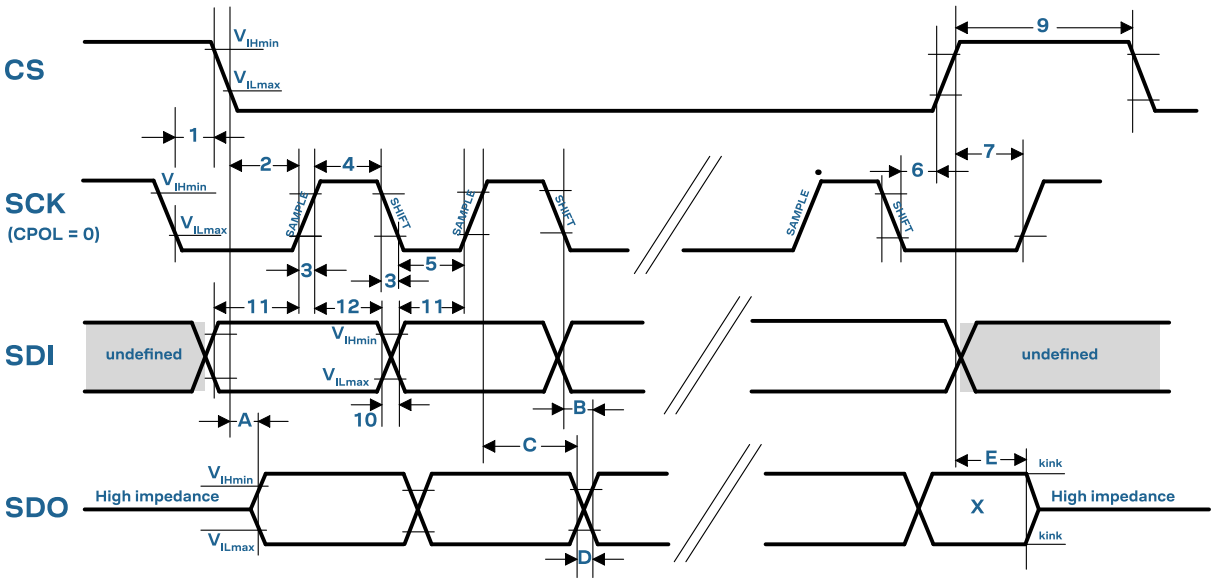


Figure 3: ZED-X20P SPI specification mode 1: CPHA=0 SCK = 5.33 MHz

Symbol	Parameter	Min	Max	Unit
1	CS deassertion hold time	8	-	ns
2	Chip select time (CS to SCK)	11	-	ns
3	SCK rise/fall time	-	5	ns
4	SCK high time	39	-	ns
5	SCK low time	39	-	ns
6	Chip deselect time (SCK falling to CS)	3	-	ns
7	Chip deselect time (CS to SCK)	510	-	ns
9	CS high time	511	-	ns
10	SDI transition time	-	5	ns
11	SDI setup time	6	-	ns
12	SDI hold time	3	-	ns

Table 22: SPI peripheral input timing parameters 1 - 12

Symbol	Parameter	Min	Max	Unit
A	SDO data valid time (CS)	15	31	ns
B	SDO data valid time (SCK), weak driver mode	15	29	ns
C	SDO data hold time	49	68	ns
D	SDO rise/fall time, weak driver mode	3	8	ns
E	SDO data disable lag time	7	20	ns

Table 23: SPI peripheral timing parameters A - E, 2 pF load capacitance

Symbol	Parameter	Min	Max	Unit
A	SDO data valid time (CS)	17	42	ns
B	SDO data valid time (SCK), weak driver mode	16	39	ns
C	SDO data hold time	52	88	ns
D	SDO rise/fall time, weak driver mode	2	21	ns
E	SDO data disable lag time	7	20	ns

Table 24: SPI peripheral timing parameters A - E, 20 pF load capacitance

Symbol	Parameter	Min	Max	Unit
A	SDO data valid time (CS)	20	62	ns
B	SDO data valid time (SCK), weak driver mode	19	59	ns
C	SDO data hold time	58	128	ns
D	SDO rise/fall time, weak driver mode	7	38	ns
E	SDO data disable lag time	7	20	ns

Table 25: 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.

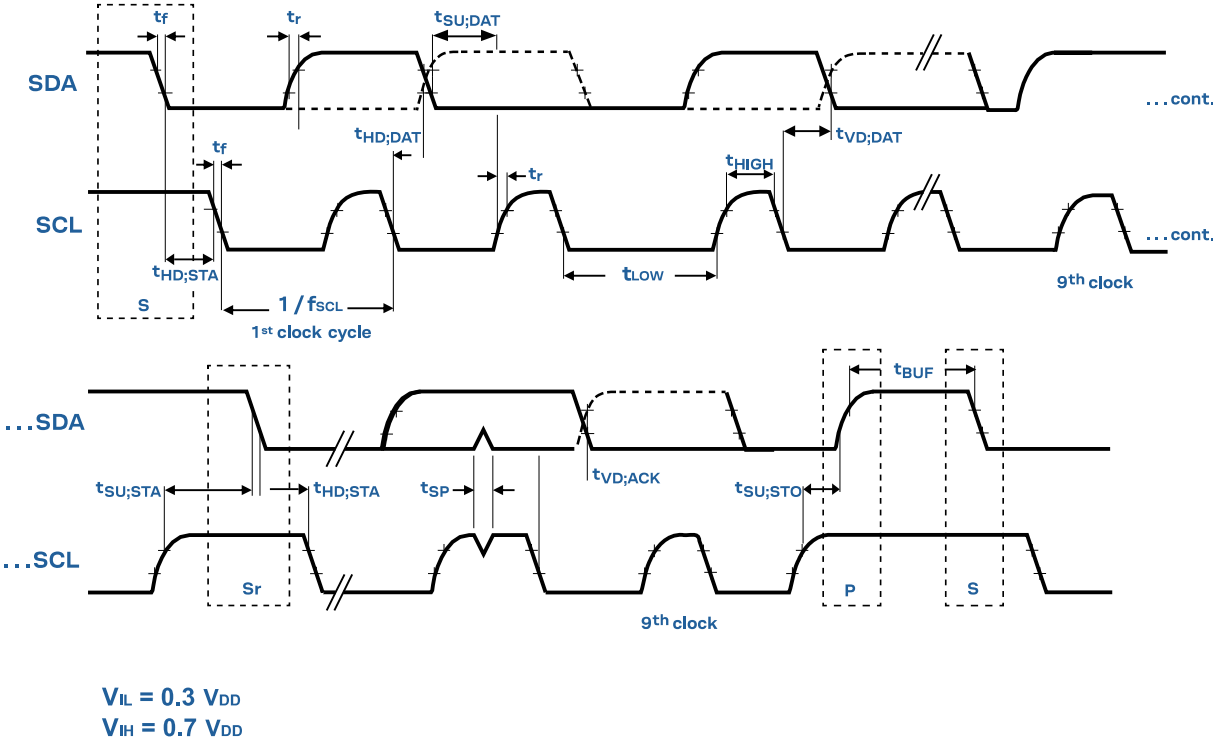


Figure 4: ZED-X20P I2C peripheral specification

		I2C Fast-mode		
Symbol	Parameter	Min	Max	Unit
f_{SCL}	SCL clock frequency	-	1000	kHz
$t_{HD;STA}$	Hold time (repeated) START condition	0.26	-	µs
t_{LOW}	Low period of the SCL clock	0.26	-	µs
t_{HIGH}	High period of the SCL clock	0.5	-	µs
$t_{SU;STA}$	Setup time for a repeated START condition	0.26	-	µs

		I2C Fast-mode		
Symbol	**Parameter**	**Min**	**Max**	**Unit**
$t_{HD;DAT}$	Data hold time	0 [19]	- [20]	µs
$t_{SU;DAT}$	Data setup time	50 [21]	-	ns
t_r	Rise time of both SDA and SCL signals	-	120	ns
t_f	Fall time of both SDA and SCL signals	-	120	ns
$t_{SU;STO}$	Setup time for STOP condition	0.26	-	µs
t_{BUF}	Bus-free time between a STOP and START condition	0.5	-	µs
$t_{VD;DAT}$	Data valid time	-	0.45 [20]	µs
$t_{VD;ACK}$	Data valid acknowledge time	-	0.45 [20]	µs
V_{nL}	Noise margin at the low level	TBD	-	V
V_{nH}	Noise margin at the high level	TBD	-	V
Cb	Capacitive load for each bus line	-	550	pF
Cb	Capacitive load for each bus line	-	550	pF

Table 26: ZED-X20P 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 **GGA, GLL, GSA, GSV, RMC, VTG, TXT** messages are output by default. UBX and RTCM 3.4 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 3.4 input protocols are enabled by default.
UART2 output	38400 baud, 8 bits, no parity bit, 1 stop bit. RTCM 3.4 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. RTCM 3.4 protocol is enabled by default. SPARTN 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.

19 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.

20 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.

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

Interface	Settings
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 27: Default interface settings

☞ Refer to the applicable Interface description for information about further settings.

☞ By default, ZED-X20P 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

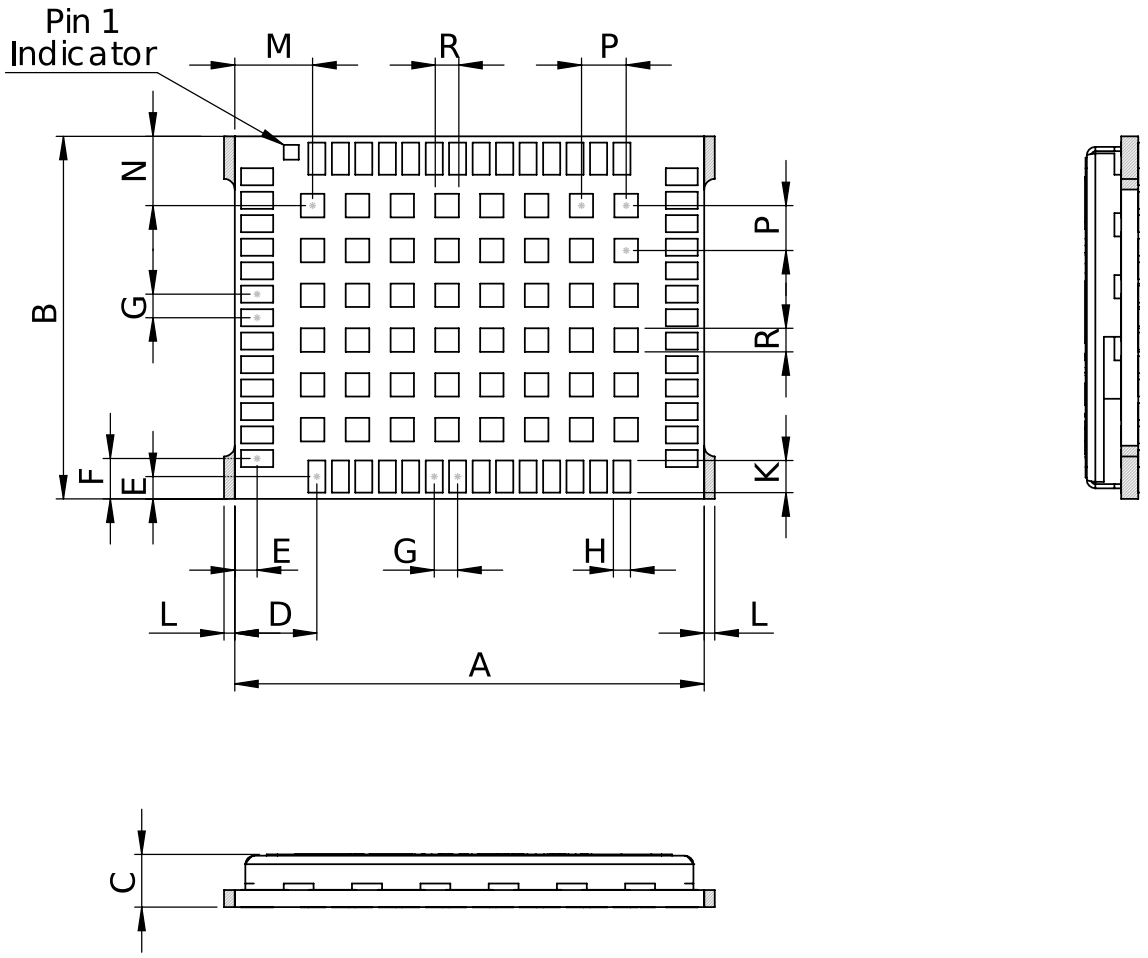


Figure 5: ZED-X20P mechanical drawing

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		1.6 g	

Table 28: ZED-X20P 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

Type	Description
Quality and reliability	
Product qualification	Qualified according to u-blox qualification policy, based on a subset of AEC-Q104.
Chip qualification	Modules are based on AEC-Q100 qualified GNSS chips.
Manufacturing	Manufactured at ISO/TS 16949 certified sites.
Environmental	
RoHS compliance	Yes
Moisture sensitivity level (MSL)[22, 23]	4
Type approvals	
European RED certification (CE)	TBD
UK conformity assessment (UKCA)	TBD

Table 29: Qualifications and approvals

22 For the MSL standard, see IPC/JEDEC J-STD-020 and J-STD-033 [3].

23 For more information regarding moisture sensitivity levels, labeling, storage, and drying, see the Product packaging reference guide [4].

8 Packaging

The components are delivered as hermetically sealed, reeled tapes in order to enable efficient production, production lot set-up and tear-down. For more information about packaging, see the Product packaging reference guide [4].

Figure 6: Reeled u-blox modules

8.1 Reels

The ZED-X20P receivers are deliverable in quantities of 250 pieces on a reel. The receivers are shipped on reel type B, as specified in the Product packaging reference guide [4].

Package	Reel type	Delivery quantity
SMD	B	250

Table 30: Reel information for modules

8.2 Tapes

Figure 7 shows the feed direction and illustrates the orientation of the components on the tape:

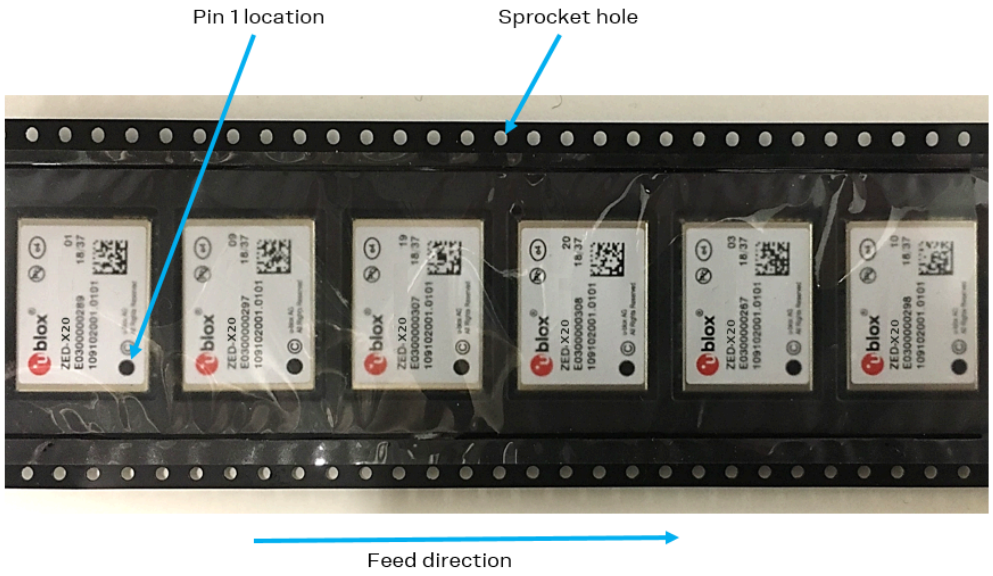
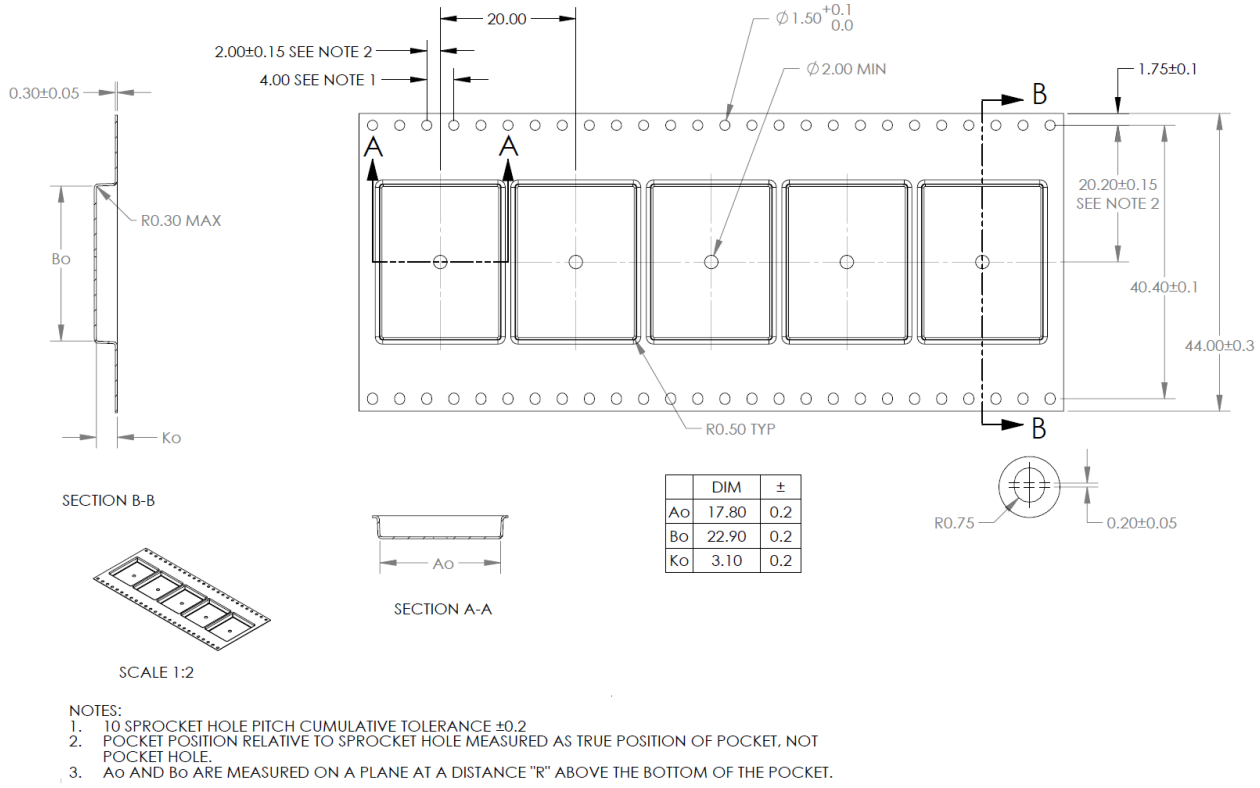


Figure 7: Orientation of the u-blox components on the tape

The dimensions of the tapes for ZED-X20P are specified in Figure 8 (measurements in mm).



	DIM	±
Ao	17.80	0.2
Bo	22.90	0.2
Ko	3.10	0.2

Figure 8: ZED-X20P tape dimensions (mm)

9 Soldering

For information on reflow soldering, see IPC/JEDEC J-STD-020 [3] and Integration manual[1].

10 Labeling and ordering information

This section provides information about product labeling and ordering.

10.1 Product label

The labeling of ZED-X20P package provides product information and revision information. For more information, contact u-blox sales.

Figure 9 provides an example of ZED-X20P label with information on the product and revision.

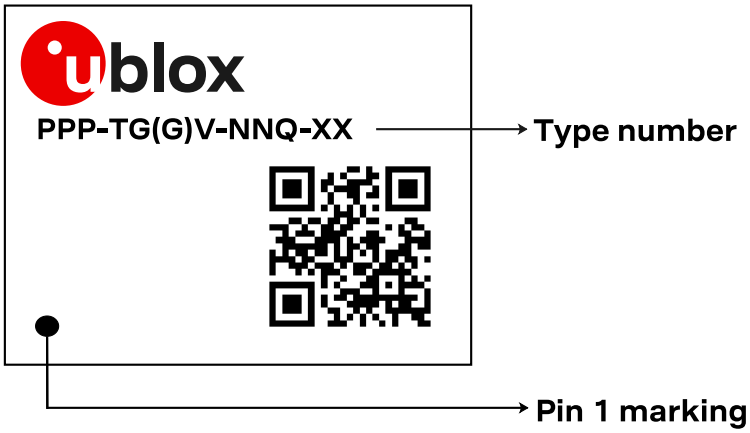


Figure 9: Example of ZED-X20P label

For a description of the product label, see Table 31.

Code	Meaning	Example
PPP	Form factor	ZED
TG(G)	Platform	X20 = u-blox X20
V	Variant	P = High precision
NN	Major product version	00, 01, ..., 99
Q	Product grade	A = Automotive B = Professional C = Standard
XX	Revision	Hardware and firmware versions
Other information	Production date	Year/week (YY/WW or YYWW), e.g. 24/04 or 2404

Table 31: Description of the product label

10.2 Product identifiers

The ZED-X20P label has three product identifiers: product name, ordering code and type number. The product name is used in documentation such as this data sheet and identifies all u-blox products, independent of packaging and product grade. The ordering code includes the major product version and product grade, while the type number additionally includes the hardware and firmware versions.

Table 32 provides product code formats.

Format	Structure	Product code
Product name	PPP-TGGV	ZED-X20P

Format	Structure	Product code
Ordering code	PPP-TGGV-NNQ	ZED-X20P-00B
Type number	PPP-TGGV-NNQ-XX	ZED-X20P-00B-00

Table 32: Product code formats

10.3 Ordering codes

Ordering code	Product	Remark
ZED-X20P-00B	ZED-X20P	Shipped with firmware HPG 2.00B01

Table 33: 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] Integration manual, UBXDOC-963802114-12901
[2] Interface description, UBXDOC-963802114-12904
[3] MSL standard IPC/JEDEC J-STD-020, www.jedec.org
[4] Product packaging reference guide UBX-14001652

For product change notifications and regular updates of u-blox documentation, register on our website, https://www.u-blox.com.

Revision history

Revision	Date	Comments
R01	06-Sep-2024	Initial revision

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