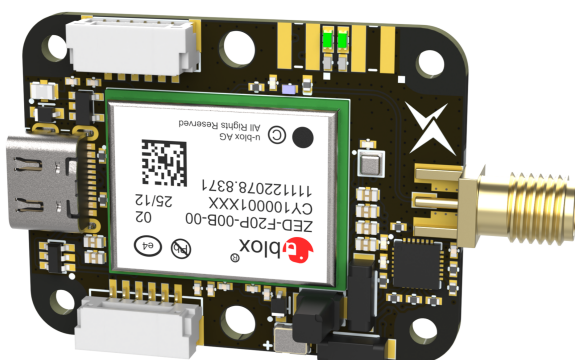


*Delivers centimeter level accuracy within seconds based on U-blox triple-band L1/L2/L5 **ZED-F20P** GNSS RTK module. Onboard **RM3100** magnetometer and **BMP581** barometric sensor.*

Datasheet - In Production



Features

- 5V - 100mA power supply
- LEDs status: Power/RTK
- Timepulse & External Interrupt
- USB-C/I²C/SPI/UART interfaces
- Onboard Bosch BMP581 barometer
- Onboard PNI RM3100 compass
- 3.3V Active antenna input

Applications

- Drones
- RTK Base
- Ground vehicles
- Precise navigation

Description

The Siderion **SP0703** is an affordable, compact, and high-precision triple-band L1/L2/L5 GNSS RTK (Real-Time Kinematic) device.

Powered by the latest generation of u-blox **ZED-F20P** modules, the Pioneer F20P supports concurrent reception of GPS, Galileo, BeiDou, QZSS, and NavIC signals. Consequently, the device delivers reliable performance and fast convergence, achieving centimeter-level accuracy in seconds.

The onboard **BMP581** absolute barometric pressure sensor and the professional-grade **RM3100** compass enhance the overall performance of the Pioneer F20P.

Its JST-GH connectors make it ideal for integration with Pixhawk, ArduPilot or any other autopilot systems.

The SP0703 operates across a temperature range from -40°C to +70°C.

Table 1. Device summary

Order ref code	Temperature [°C]	Product size [mm]	Weight [g]
SID-GNSS-RTK-SP0703	-40 to +70	51.0 x 33.0 x 13.4	13

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1. Block diagram and pin description

1.1 Block diagram

Figure 1. SP0703 block diagram & connectivity

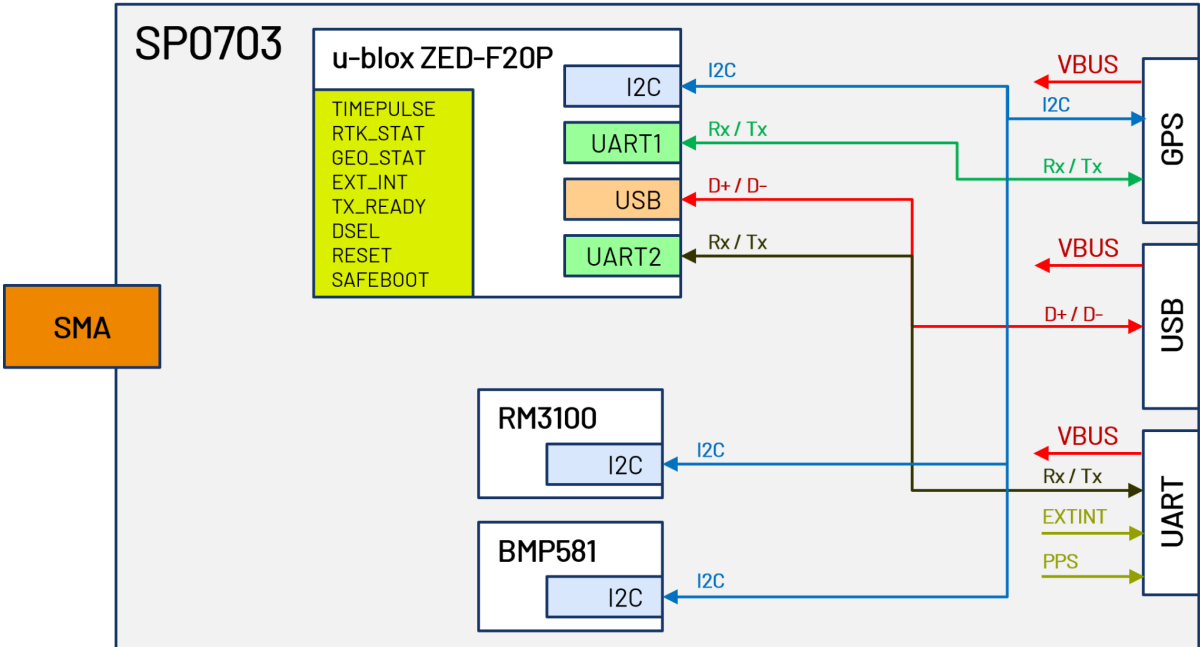
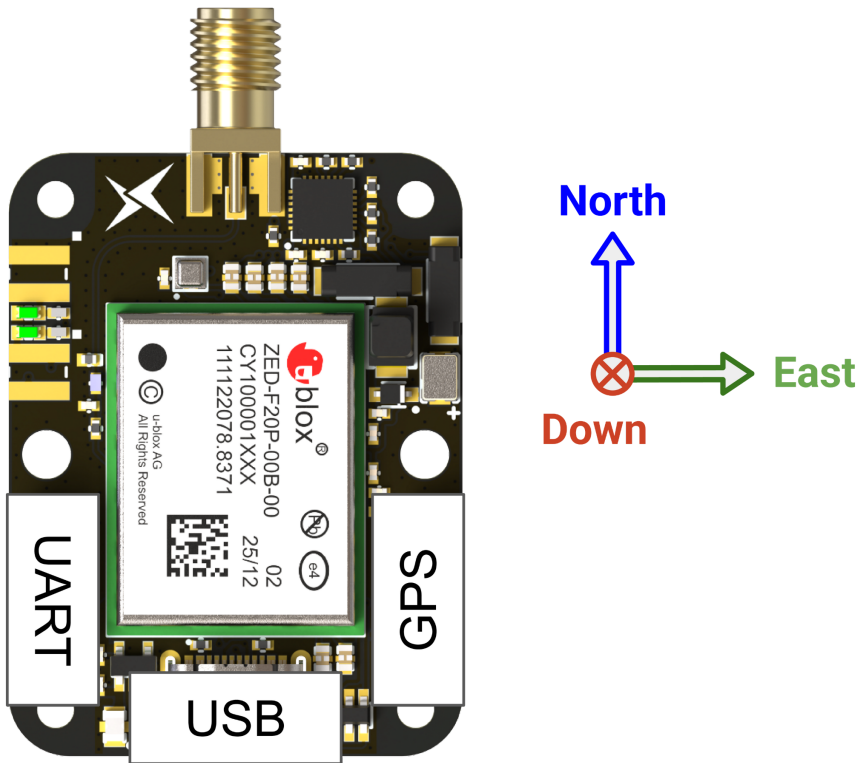


Figure 2. SP0703 North-East-Down (NED) orientation (top view)



1.2 LED description

Table 2. Pioneer F20P LED sequence status

LED name	Color	Light sequence	Comment
Power	Blue		Solid blue LED when powered ON
RTK Status	Green		3D fix mode / No RTK fix
			RTK fix but no FIXED RTK fix
			FIXED RTK fix

1.3 Pin description

Figure 3. SP0703 pinout (top view & side views)

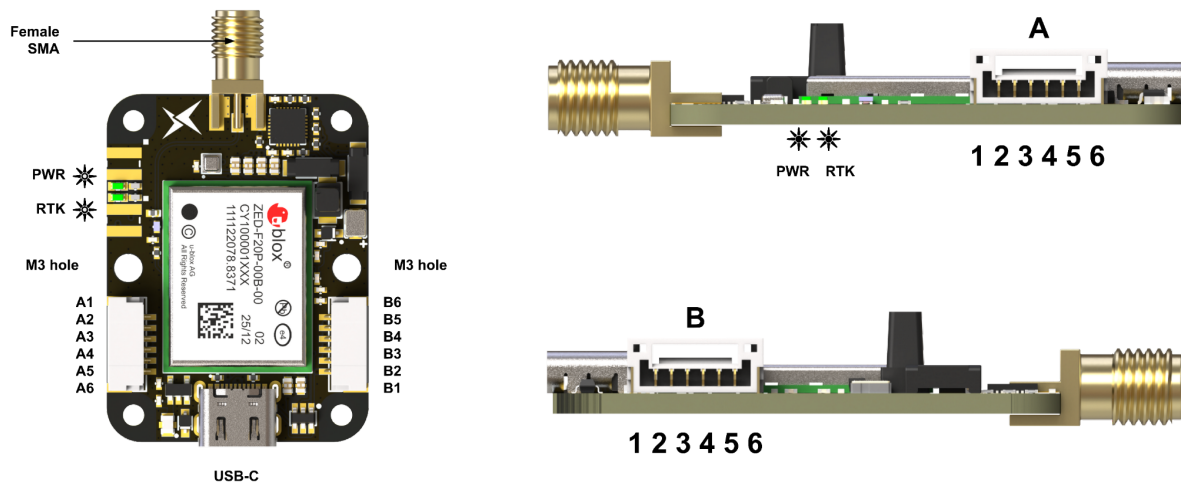


Table 3. Pinout configuration

	Pin	Name	Type	Function
UART	A1	5V IN	P	5V input
	A2	UART2 TXD	O	UART2 transmit
	A3	UART2 RXD	I	UART2 receive
	A4	EXTINT	I	External Interrupt
	A5	TIMEPULSE	O	Timepulse output
	A6	GND	P	Ground reference
GPS	B1	5V IN	P	5V input
	B2	UART1 RX / SPI MOSI	I	UART1 receive OR SPI MOSI
	B3	UART1 TX / SPI MISO	O	UART1 transmit OR SPI MISO
	B4	I2C SCL / SPI SCLK	I	I2C clock OR SPI clock
	B5	I2C SDA / SPI CS	I/O	I2C data OR SPI chip select
	B6	GND	P	Ground reference

P : Power / I : Input / O : Output

Note: The SPI port is available only when the **D_SEL** pin is pulled **LOW**.

2. Absolute maximum ratings

Stresses above those listed as “absolute maximum ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device under these conditions is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

Table 4. Pioneer F20P absolute maximum ratings

Symbol	Parameter	Maximum value	Units
Vusb	USB supply voltage	-0.3 to +6	V
Vdd	Internal supply voltage	-0.5 to +3.6	V
Vdd_IO	I/O pins supply voltage	-0.5 to Vdd+0.1	V
Icc_RF	RF output current	300	mA
Prfin	Input power at RF_IN	10	dBm
W	Product weight	13	g
TOP	Operating temperature	-40 to +70	°C
TSTG	Storage temperature	-40 to +80	°C



This device is sensitive to electrostatic discharge (ESD), improper handling can cause permanent damage to the part.

3. Specifications

3.1 Ublox ZED-F20P specifications

Table 5. ZED-F20P mechanical and electrical specifications

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Units
Vusb	USB supply voltage		4.5	5.0	5.5	V
Vdd	Internal supply voltage			3.3		V
Vdd_IO	Supply voltage for I/O			3.3		V
Idd	Current consumption	w/o active antenna		50		mA
		w/ active antenna		130		mA
Vdd_RF	Output RF voltage			Vdd-0.1		V
Idd_RF	Output RF current			50		mA
Vil	IO pin low lvl input volt		0		0.8	V
Vih	IO pin high level input voltage		2		Vdd +0.3	V
Vol	IO pin low level output voltage	Iol = 1mA			0.4	V
Voh	IO pin high level output voltage	Ioh = 1mA	Vdd-0.4			V
Top	Operating temperature		-40		+70	°C
I2Cadd	Default 7bit I ² C address	0b1000010 (0x42)				

Table 6. ZED-F20P general performance

Parameter	Specifications	Value
Receiver type	Multi-band GNSS high precision	
Accuracy of Timepulse	RMS	30 ns
Frequency of Timepulse		0.25 Hz to 10 MHz
Operational limits	Dynamics Altitude Velocity	< 4g 80,000 m 500 m/s
Velocity accuracy		0.03 m/s

Table 7. ZED-F20P performance in different GNSS mode

GNSS	Parameter	GPS+GAL+BDS	GPS+BDS	GPS+GAL	GPS
Acquisition	Cold start Hot start Aided start	25 s 2 s 2 s	-	-	-
Update rate	RTK PVT RAW	25 Hz 25 Hz 25 Hz	-	-	-
Convergence time	RTK	< 7 s	-	-	-
Horizontal pos. accuracy	PVT RTK	1.2 m CEP 0.006 m + 1ppm CEP	-	-	-
Vertical pos. accuracy	RTK	0.01 m + 1ppm CEP	-	-	-
Sensitivity	Tracking & Nav. Reacquisition Cold start Hot start	-167 dBm -160 dBm -148 dBm -158 dBm	-	-	-

Table 8. ZED-F20P supported GNSS constellations and signals

System	Signal	Frequency
GPS	L1C/A L2C L5	1575.420 MHz 1227.600 MHz 1176.450 MHz
Galileo	E1-B/C E5a	1575.420 MHz 1176.450 MHz
BeiDou	B1I B1C B2a	1561.098 MHz 1575.420 MHz 1176.450 MHz
QZSS	L1C/A, L1C/B L2C L5	1575.420 MHz 1227.600 MHz 1176.450 MHz
NavIC	L1-SPS Data L5-SPS	1575.420 MHz 1176.450 MHz

3.2 PNI RM3100 specifications

Table 9. RM3100 electrical specifications

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Units
Vdd	Internal supply voltage		2.0	3.0	3.6	V
Vdd_IO	Supply voltage for I/O		2.0	3.0	3.6	V
Vdd_Ripple	Vdd ripple voltage				0.05	Vpp
Idd	Current consumption				1	mA
Vil	IO pin low level input voltage		0		0.3* Vdd	V
Vih	IO pin high level input voltage		0.7* Vdd		Vdd	V
Iidle	Idle Mode Current				1	μA
Ileak	Leakage Current @ DVDD pin (AVDD=AVSS=DVSS=0V, DVDD=3.6V)				100	nA
Top	Operating temperature		-20		+85	°C
I2Cadd	7bit I2C address	0b0100000				

Table 10. RM3100 Geomagnetic Sensor Performance

Parameter	Cycle counts			Units
	50	100	200	
Field Measurement Range	-800 to +800			μT
Gain	20	38	75	LSB/μT
Sensitivity	50	26	13	nT
Noise	30	20	15	nT
Noise Density @ Max. Single-Axis Sample Rate	1.2			nT/√Hz
Repeatability over ±200 μT	15	8	8	nT
Hysteresis over ±200 μT	15			nT
Linearity over ±200 μT	0.5			%

Maximum Single-Axis Sample Rate (divide by 3 for max. 3-axis sample rate)	1600	850	440	Hz
Single-Axis Average Current @ 24 Hz Sample Rate (equivalent to 3-axis @ 8 Hz)	70	135	260	μA
Bias Resistor, Rb	121			Ω
Ext. Timing Resistor for Clock, REXT	33			KΩ
Circuit Oscillation Frequency	180			kHz

3.3 Bosch Sensortech BMP581 specifications

Table 11. BM581 electrical specifications

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Units
Type	Absolute barometric pressure sensor					
Pres	Pressure Range		30		125	kPa
Vdd	Supply Voltage (VDD)		1.65		3.6	V
Idd	Current Consumption	Peak Deep standby			260 0.55	μA
Abac	Absolute Accuracy	-5°C to 65°C		±30		Pa
Reac	Relative Accuracy	700 to 1100 hPa		±6		Pa
Reac	Relative Accuracy	900 to 1100 hPa		±0.4		Pa
Noise	Noise (Lowest Bandwidth)			0.08		Pa
Temp_off	Temperature Coefficient Offset			±0.5		Pa
ltd	Long-term Drift (12 months)			±0.1		Pa
Sd	Solder Drift			±30		Pa
ODR	Output Data Rate	continuous mode normal mode			480 240	Hz Hz
Int	Interfaces	I ² C			1	MHz
Temp	Temperature Range		-40		85	°C
I2Cadd	7bit I2C address	0b1000110				

4. Applications

4.1 Standalone configuration

Figure 4. U-blox ANN-MB2 GNSS antenna attached to the Pioneer F20P

5. Communication interfaces

There are 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 Vdd supply voltage.

5.1 UART Interface

There are two UART interfaces: UART1 and UART2. UART1 and UART2 operate up to and including a speed of 8 Mbaud. No hardware flow control on UART1 and UART2 is supported. UART1 is enabled by default if D_SEL is not tied to ground.

Figure 5. UART chronogram specifications

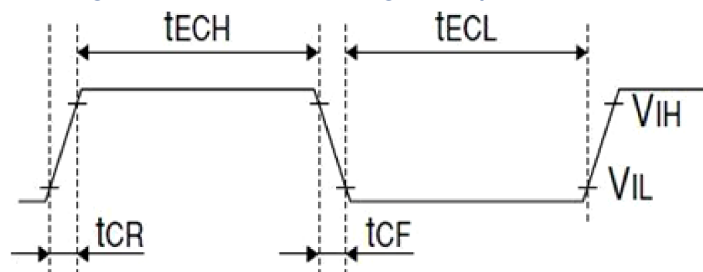


Table 12. Pioneer F20P serial UART timing specifications

Symbol	Parameter	Min.	Max.	Units
V_{IL}	LOW-LEVEL input voltage	0	$0.2 \times V_{DD}$	V
V_{IH}	HIGH-LEVEL input voltage	$0.7 \times V_{DD}$	$V_{DD} + 0.3$	V
tECH	HIGH period of external data input	0	0.4	μs
tECL	LOW period of external data input	TBA	TBA	μs
Ru	Baudrate	4800	8	Mbps
tCR	Rise time of data		5	ns
tCF	Fall time of data		5	ns

5.2 SPI interface

The Pioneer F20P has an SPI slave interface that can be selected by tying the **D_SEL** input pin to ground. The SPI slave interface is shared with UART1. The SPI pins available are: SPI_MISO (TXD), SPI_MOSI (RXD), SPI_CS_N, SPI_CLK. The SPI interface is designed to allow communication to a host CPU. The interface can be operated in slave mode only. Note that SPI is not available in the default configuration because its pins are shared with the UART and I2C interfaces. The maximum transfer rate using SPI is 950 kB/s and the maximum SPI clock frequency is 12.8 MHz.

This section provides SPI timing values for the ZED-F20P slave operation. The following tables present timing values under different capacitive loading conditions. Default SPI configuration is CPOL = 0 and CPHA = 0.

Figure 6. SPI chronogram specifications

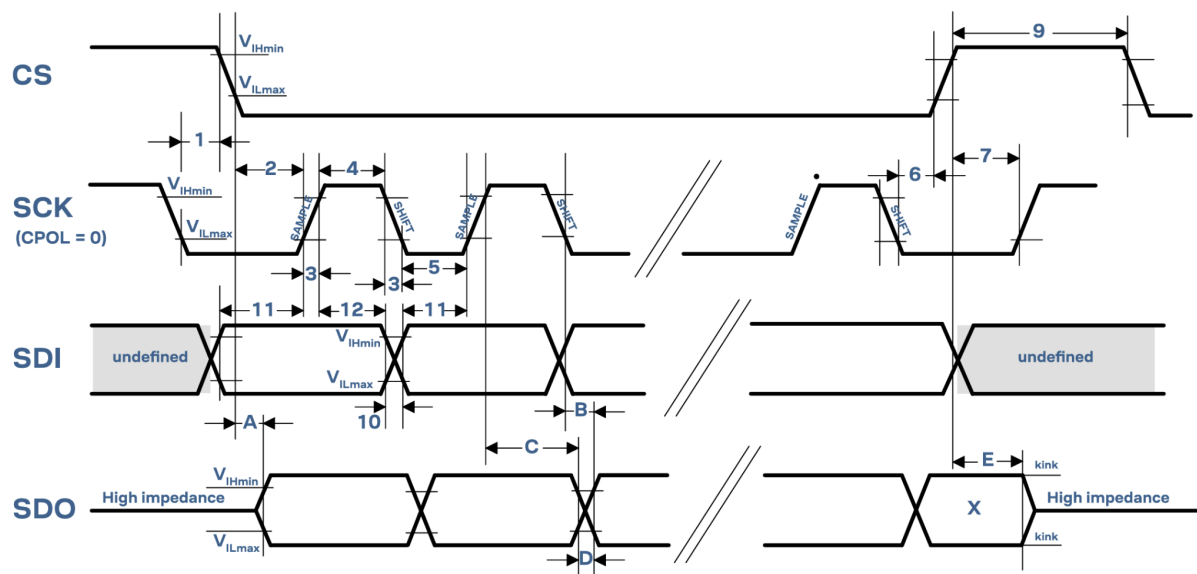


Table 13. Pioneer F20P SPI timing specifications

Timing value @ 20pF load	Min [ns]	Max [ns]
"A" - MISO data valid time (CS)	17	42
"B" - MISO data valid time (SCK) weak driver mode	16	39
"C" - MISO data hold time	52	88
"D" - MISO rise/fall time, weak driver mode	2	21
"E" - MISO data disable lag time	7	20

5.3 Slave I2C interface

An I2C compliant interface is available for communication with an external host CPU. The interface can be operated in slave mode only. It is fully compatible with Fast-Mode-Plus of the I2C industry standard. Since the maximum SCL clock frequency is 1 MHz (in Fast-Mode-Plus), the maximum bit rate is 1 Mbit/s. The interface stretches the clock when slowed down while serving interrupts, therefore the real bit rates may be slightly lower.

Note : The I2C interface is only available with the UART default mode. If the SPI interface is selected by tying the **D_SEL** input to ground, the I2C is not available.

Figure 7. I2C chronogram specifications

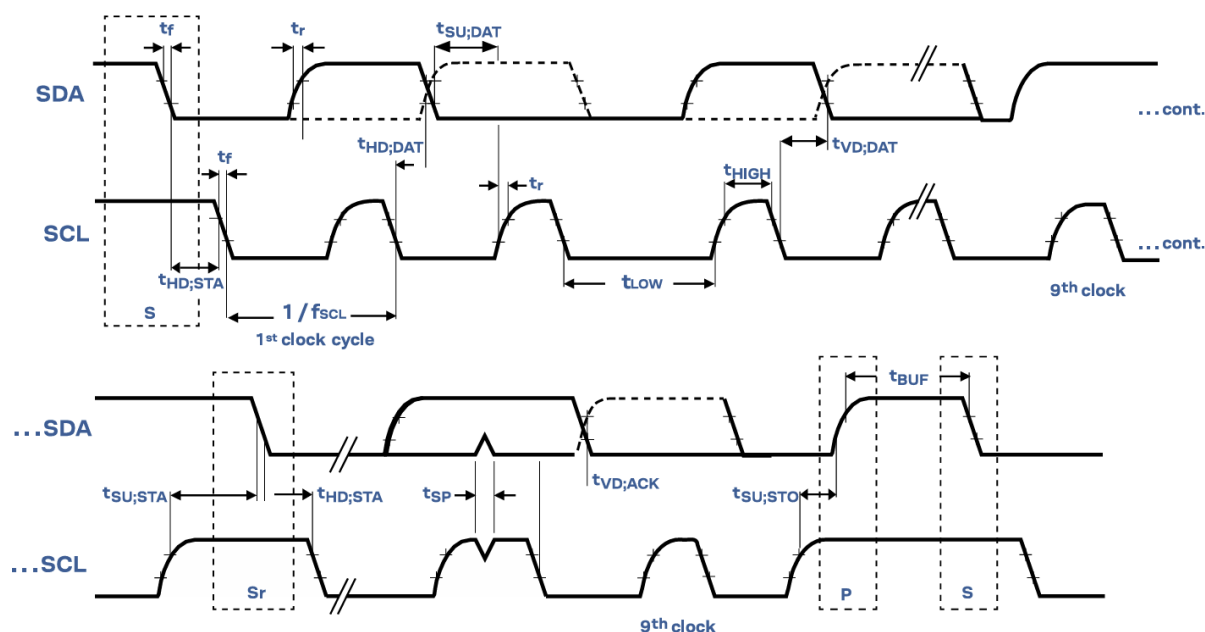


Table 14. Pioneer F20P I2C timing specifications

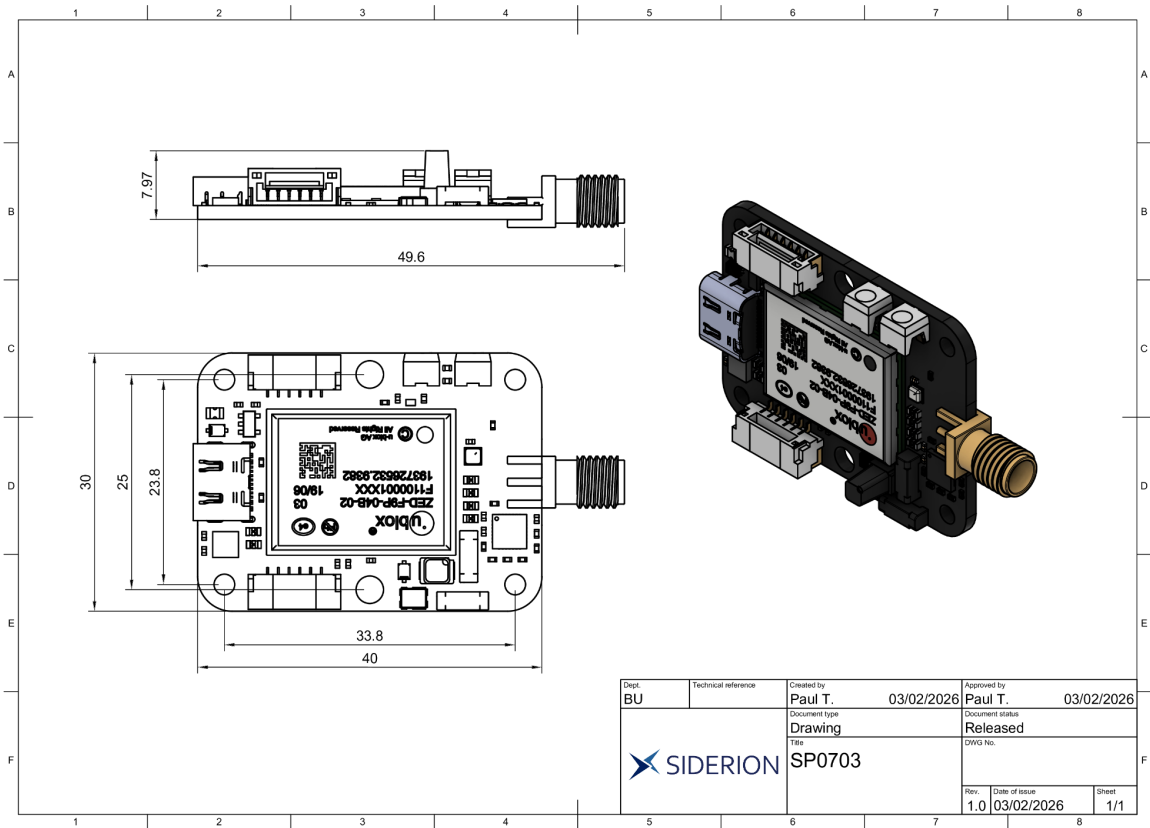
Symbol	Parameter	Min	Max	Units
Vil	LOW-LEVEL input voltage	Vss-0.3	0.3xVdd	V
Vih	HIGH-LEVEL input voltage	0.7xVdd	Vdd+0.3	V
Cb	Capacitive load for each bus line	400 (standard & fast modes)	550 (fast mode plus)	pF
Fscl	SCL clock frequency	0	1	MHz

5.4 USB interface

A USB interface, which is compatible with USB version 2.0 FS (Full Speed, 12 Mbit/s), can be used for communication as an alternative to the UART.

6. Mechanical drawings

Figure 8. SP0703 v1.0 mechanical drawings



7. Revision history

Table 15. Document revision history

Date	Revision	Changes
06-Feb-2025	1.0	SiderionDoc_SP0703 / Initial release
26-May-2026	1.1	Figure 1 - Block Diagram added

8. Appendix

U-blox ZED-F20P datasheet: [ZED-F20P-00B Data sheet](#)

U-blox ZED-F20P integration manual: [ZED-F20P Integration manual](#)

U-blox ZED-F20P interface description: [u-blox F20 HPG 2.02 Interface description](#)

Siderion user's guide:

Siderion tutorials:

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