P20L
High precision dual frequency RTK module

V1.0.8

REVISIONS

Version	Release notes	Date
V1.0.0	Beta version	2022-03-18
V1.0.1	Add UART1 and the corresponding configuration commands	2022-04-15
V1.0.2	Supports low power consumption, standby mode	2022-04-28
V1.0.3	Modify Standby Mode Command Parameter Description	2022-05-05
V1.0.4	Modify module power consumption, update circuit diagram	2022-05-23
V1.0.5	Adding Dimensional Packages	2022-08-05
V1.0.7	Updated the SMT photography, added some new commands and modified some parameters.	2023-04-17
V1.0.8	Increased speed accuracy	2023-05-23

catalogs

1. Introductions

The P20L is a high performance GNSS RTK module designed for applications requiring centimeter-level accuracy. It supports BDS, GPS, GALILEO, GLONASS, QZSS, and has up to 50+ satellites visible in the Asia Pacific region, ensuring reliable and consistent positioning in a variety of environmental conditions.

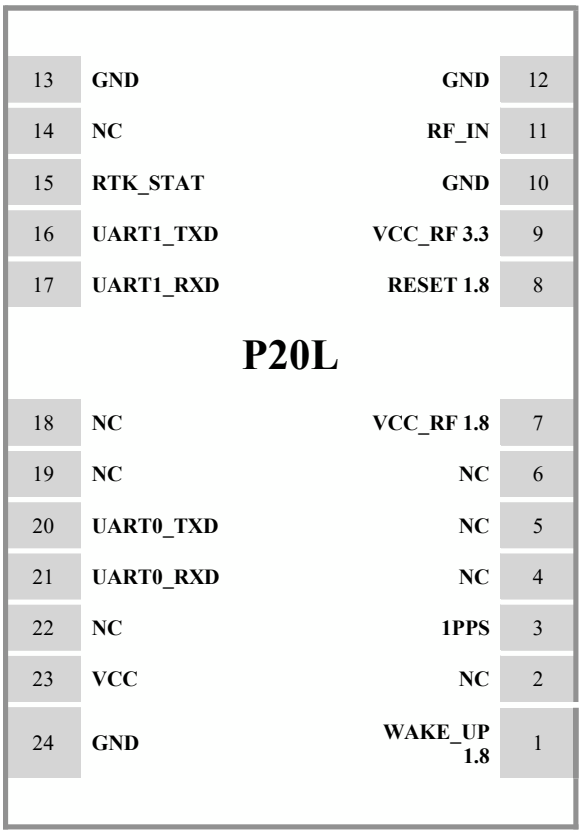
2. Features

- Full system dual-frequency RTK positioning solution, positioning accuracy can reach 1cm+1ppm
- Support BDS, GPS, GALILEO, GLONASS, QZSS
- Small size and good IO compatibility
- Supports low power consumption

3. Parameters

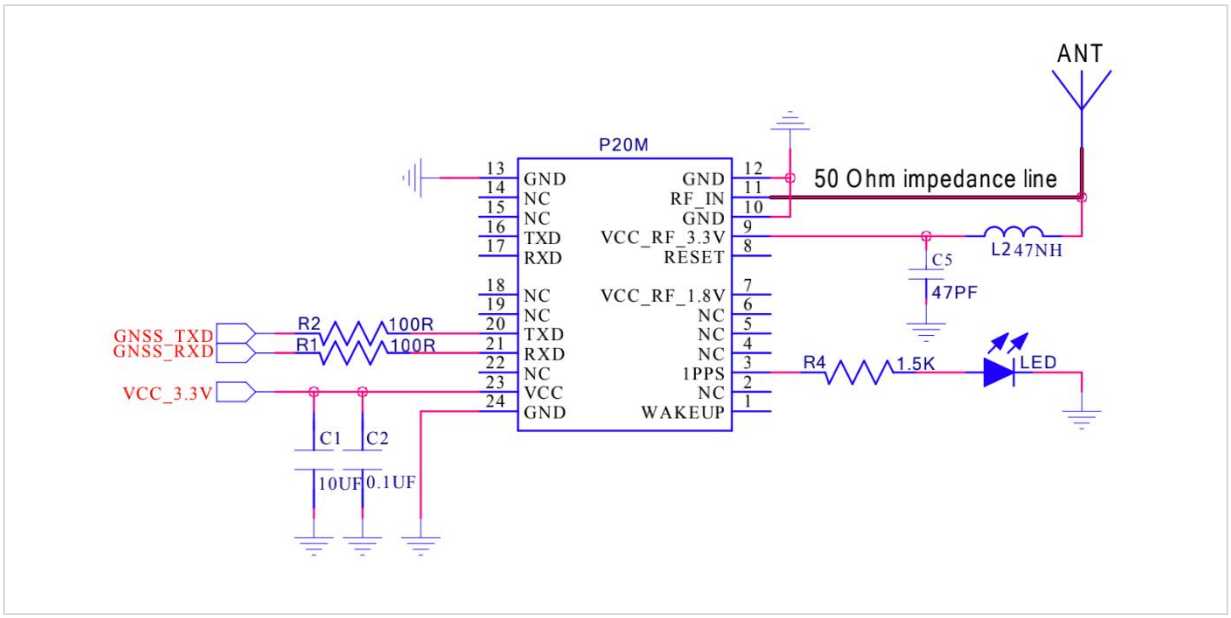
Category	**Performance index**	
Receive Type	GPS/QZSS: L1/L5	
	BeiDou: B1I/B2a	
	GALILEO: E1/E5a	
	GLONASS: G1	
Frequency of data updates	1Hz	
sensitivity	Tracking & Nav.	-165dBm
	Reacquisition	-160dBm
	Capture sensitivity	-148dBm
Initial positioning time	cold start	≤27s
	hot start	2s
Fixed solution convergence time	≤ 10s (short baseline or VRS under open sky)	
Horizontal accuracy	1cm + 1ppm	
Elevation accuracy	2cm + 1ppm	
Speed Accuracy	5cm/s	
Operational limits	Velocity	515m/s
	Altitude	18km
connector	UART	2 (default baud rate 115200)
	PPS	1
data format	NMEA 0183	
	RTCM 3.3	
Electrical data	Supply voltage	2.8V~4.3V (3.3V recommended)
	RF Antenna voltage	3.3V (consistent with mains voltage)
	Low power antenna supply voltage	1.8V
	Serial voltage	2.8V
	PPS	2.8V
Power	12mA*3.3V	
Operating temp	-40°C to 85°C	
Storage temp	-40°C to 90°C	
Package	16mm*12.2mm*2.4mm	

4. Pin definition



serial number	name (of a thing)	I/O	descriptive
1	WAKE_UP	I	Wake from standby mode (1.8V)
3	1PPS	O	time pulse
7	VCC_RF 1.8V	O	Low power RF antenna supply 1.8V
8	RESET	I	Reset (1.8V)
9	VCC_RF 3.3V	O	RF antenna power supply 3.3V
10	GND	I	ground
11	RF_IN	I	Antenna Signal Input
15	RTK_STAT	o	High level->fixed solution,low level->non-fixed solution
16	UART1_TXD	O	NMEA-0183, Base Station Mode RTCM3 Differential Outputs
17	UART1_RXD	I	Differential Data, AT Command, FOTA Upgrade
20	UART0_TXD	O	Main serial port (same function as UART1_TXD)
21	UART0_RXD	I	Differential data, AT commands, FOTA upgrade
23	VCC	I	main power

5. Referebce design



Reference Circuit V2.0

6. Antenna Characteristics

parameters	minimum value	maximum values	unit (of measure)
Input Gain	18	25	dB

7. Commands

AT+GPGGA=UART0/1,n	Select serial port to output GGA every n epochs
AT+GPRMC=UART0/1,n	Select serial port to output RMC every n epochs
AT+GPSAT=UART0/1,n	Select serial port to output GSV/GSA every n epochs
AT+GPGST=UART0/1,n	Select serial port to output GST every n epochs
AT+GPGLL=UART0/1,n	Select serial port to output GLL every n epochs
AT+GPVTG=UART0/1,n	Select serial port to output VTG every n epochs
AT+GPZDA=UART0/1,n	Select serial port to output ZDA every n epochs
AT+RTCM=UART0/1,1/0	Output/Off RTCM3 observation (base station mode) 1: output, 0: off
AT+WARM_RESET	warm start
AT+COLD_RESET	Cold start (some commands require a cold start to take effect)
AT+UARTOFF=UART0/1	Turns off all outputs from the specified serial port
AT+BAUD_RATE=UART0/1,115200	Set serial port baud rate, effective after power off and reboot
AT+READ_PARA	Read module configuration parameters
AT+THIS_PORT	Get the current corresponding serial port number
AT+BASE_LLH=lat,lon,alt	Set base station coordinates in base station mode, effective after power off and reboot
AT+AUTO_BASE=ENABLE	Set the module to automatically converge on the base station coordinates, effective after power failure and reboot
AT+RTC_MODE=n	enter standby mode, n is the time (in seconds) to keep the RTC in sleep mode, the Minimum valid time is 10 seconds, if set to 0, hardware wakeup is required.
AT+BDS_ONLY=1/0	Turn on/off the single BeiDou mode, you need to send AT+COLD_RESET or power off and restart to take effect after setting (need the latest version support)

Note: After upgrading to the latest version, if you configure the current communication serial port, you can omit UART0/1 when entering commands.

Example:

1. Serial port 0 output GGA

   AT+GPGGA=UART0,1

2. Serial port 0 off GGA

   AT+GPGGA=UART0,0

Special Note: Serial port commands should end with \r\n, can be configured through 2-way serial port each other, and support the old version of the command

Use the Base Station Mode example to illustrate:

Take the current serial port as UART0 as an example: (If it is UART1 then just change the current serial port number to UART1)

1. Turn off all outputs of the UART0 serial port:

   AT+UARTOFF=UART0

2. Output RTCM data (base station mode)

   AT+RTCM=UART0,1

3. Set up the base station location:

   at+base_llh=30.0641460,106.2280561,21.15

Manually set the coordinates of the base station in the base station mode, corresponding to the unit of latitude (°), longitude (°) and elevation (m).

Explanation: Input the base station coordinates manually, and save it manually after the command is executed successfully.

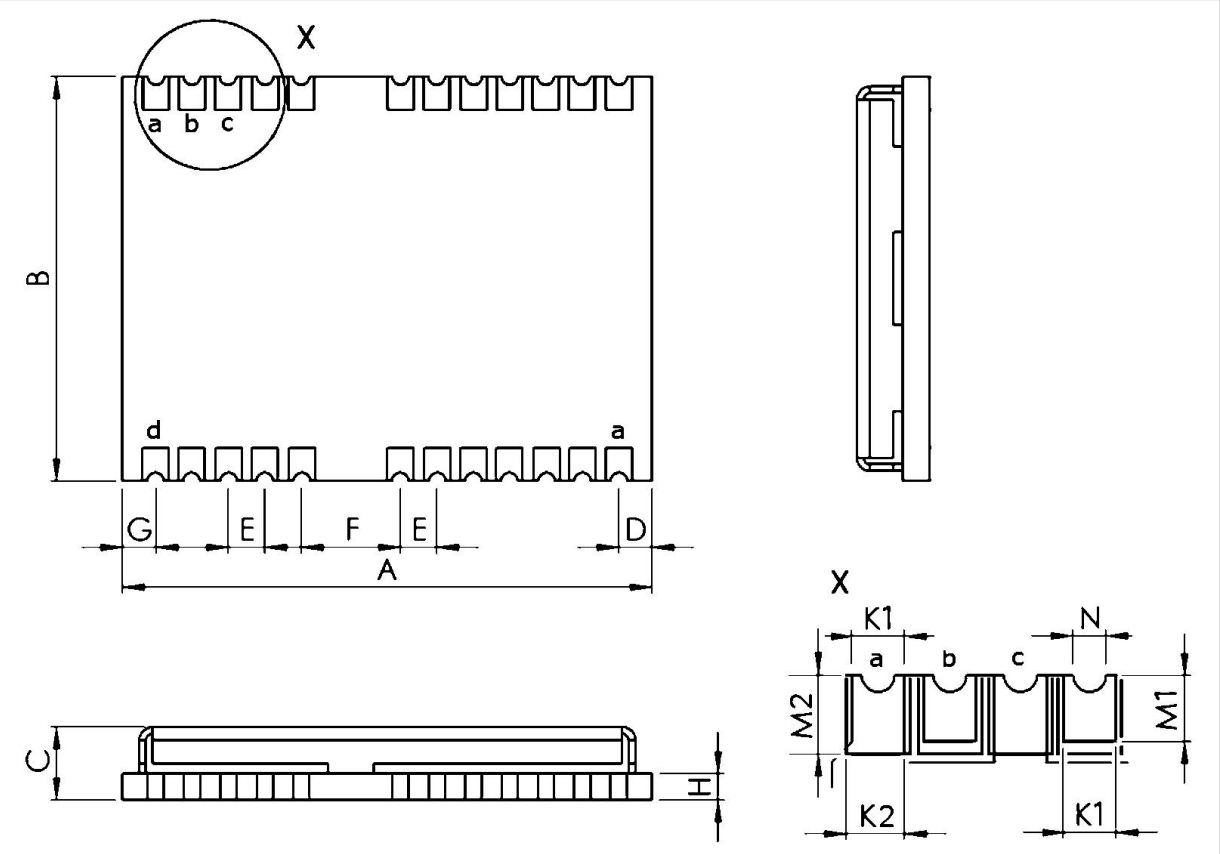
If latitude, longitude and elevation are both set to 0 (default mode) or AT+AUTO_BASE=ENABLE is sent, the position estimated inside the module is used as the BTS coordinates, and it will take effect after AT+COLD_RESET is sent or after power failure and restart, which takes about 20-30 seconds in the case of good star reception of the module, and the BTS coordinates will be re-estimated every time the module is powered up.

8. Standby mode

1.Entering standby mode: The system can enter standby mode after sending AT+RTC_MODE=n.

2.Exit standby mode: the module will automatically exit standby mode after the WAKE_UP (No.1) pin is pulled high for 10ms.

9. Size Package

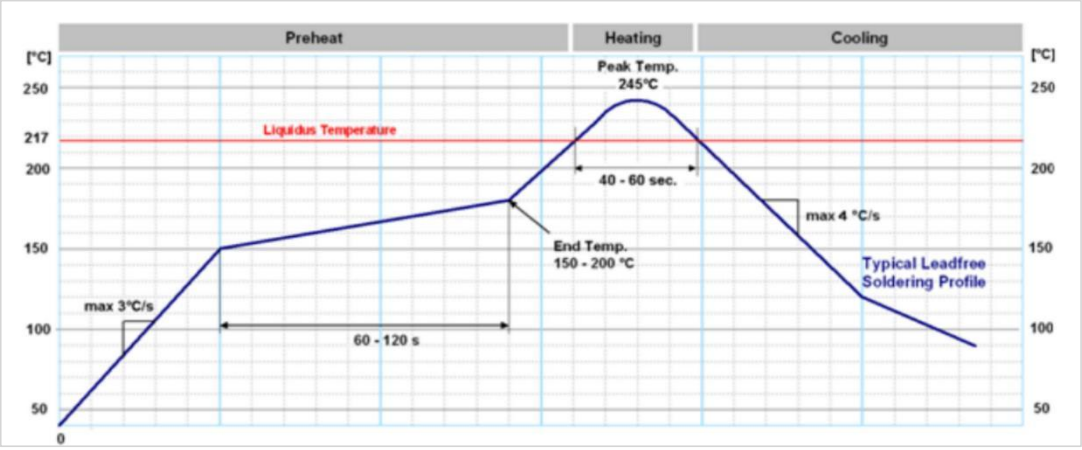


markings	descriptive	Min (mm)	Typ.(mm)	Max (mm)
A	elder	15.9	16.0	16.6
B	surname Kuan	12.1	12.2	12.3
C	Total module thickness	2.2	2.4	2.6
D,G	Horizontal Edge to Pin Spacing	0.9	1.0	1.3
E	Pin Spacing	1.0	1.1	1.2
F	Gap width	2.9	3.0	3.1
H	PCB Thickness		0.82	
K1	Pad width (metal)	0.7	0.8	0.9
K2	Pad width (metal/solder)	0.7	0.8/0.9	0.9/1.2

markings	descriptive	Min (mm)	Typ.(mm)	Max (mm)
M1	Pad height (metal)	0.7	0.8	0.9
M2	Pad height (metal/solder)	0.7	0.9	1.1
N	Welding pad half-moon diameter	0.4	0.5	0.6

10. Production requirements

1. Furnace Temperature Schematic



2. preheating phase

Temperature rise rate: max 3°C/S. If the temperature rise is too fast, it may result in a larger paste slump.

Preheating time: 60~120S. Insufficient preheating will produce large solder balls, on the contrary, preheating too long, solder balls will be gathered.

Termination temperature: 150°C to 200°C. Too low a temperature and some areas with a high amount of hot melt will not melt.

3. Heating-Reflow Stage

Liquid temperature above 217°C. Avoid a sudden rise in temperature, which may cause the material to collapse.

Time over 217°C: 40-60S.

Peak temperature: 245°C.

4. Cooling phase:

Cooling control mainly avoids solder becoming more brittle and possible mechanical tension in the solder.

Cooling rate: max 4°C/S.