



## **ACH-5206** **GPS/GALILEO/GLONASS/SBAS receiver module**

### **Data sheet**

AEAO.468173.002 \_v.0

27/08/2019



### Advantages:

Aerospace

Industrial environments

Open interface

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## *Document information*

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### *Document status explanation*

Document contains all information about GPS/GALILEO/GLONASS/SBAS receiver module. The information actually before new revision.

*This document applies to the following products:*

<b>Product name</b>	<b>Type number</b>	<b>SW version</b>	<b>PCN reference</b>
ACH-5206B	AEAO.468173.002		
ACH-5206P	AEAO.468173.002-01		
ACH-5206S	AEAO.468173.002-02		
ACH-5206H	AEAO.468173.002-03		

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# 1 Description

## 1.1 Overview

The ACH-5206 is a first model of navigation receiver from LLC “DB CENTRE” in that type. The ACH-5206 provide receiving the signals from satellites GPS, GALILEO, GLONASS and SBAS at concurrent. Due to many satellites the ACH-5206 provides high reliability of position at hard environments. His position accuracy in this environments is not worse than units of meters. In the validity zone of the SBAS, the accuracy of the position is not worse than 1.5 meters. The phase measurements are used for high accuracy of position. They may be used for RTK mode with accuracy not worse than units of centimeters.

The ACH-5206 provide modern modes and algorithms: RAIM, All in view, Detection of spoofing, "Warm" start, "Hot" start, Master-slave. Hardware and software provide parameters ACH-5206 in space environments at cosmic velocity and high to 50 000 km. Cosmic parameters are tested on the GNSS simulator CH-3810.

## 1.2 Module features

Table 1

Model	Velocity, altitude	Phase	Update rate	Grade
ACH-5206B	< 500 m/s, <18000 m	-	1, 2, 5, 10 Hz	Base
ACH-5206P	< 500 m/s, <18000 m	+	1, 2, 5, 10 Hz	High accuracy
ACH-5206S	{< 500 m/s, <18000 m; >3000 m/s, >180000 m}	-	1, 2, 5, 10 Hz	Space
ACH-5206H	0...15E3 m/s, 0 ...50E6 m	-	1, 2, 5, 10, 20 Hz	High dynamic

### 1.3 Function parameters

Table 2

Parameter	Specification			
Signals	GPS&SBAS L1 C/A	GALILEO E1 B/C		GLONASS L1 CT
Channel	36			
Horizontal position accuracy <sup>2</sup>	GPS&SBAS	GPS&GALILEO&GLONASS	GALILEO <sup>1</sup>	GLONASS
	1.5 m	2.5 m	2.8 m	7.5 m
Vertical position accuracy <sup>2</sup>	2.5 m	10 m	10 m	15 m
1PPS accuracy 3 $\sigma$	45 ns			
Velocity accuracy	0,03 m/s			
Time-To-First-Fix	“Cold” start – 60 s “Hot” start – 3 s			
Sensitivity	GPS&SBAS	GALILEO	GLONASS	
	minus 175 dB*W	minus 170 dB*W	minus 172 dB*W	
Limits <sup>3</sup>	Velocity < 500 m/s		Altitude < 18 000 m	
Limits <sup>4</sup>	Velocity < 500 m/s & >3 000 m/s		Altitude < 18 000 m & >200 000 m	
1 By situation 27.08.2019 2 PDOP <3 3 ACH-5206B & ACH-5206P 4 ACH-5206S & ACH-5206H				

## 1.4 Block diagram

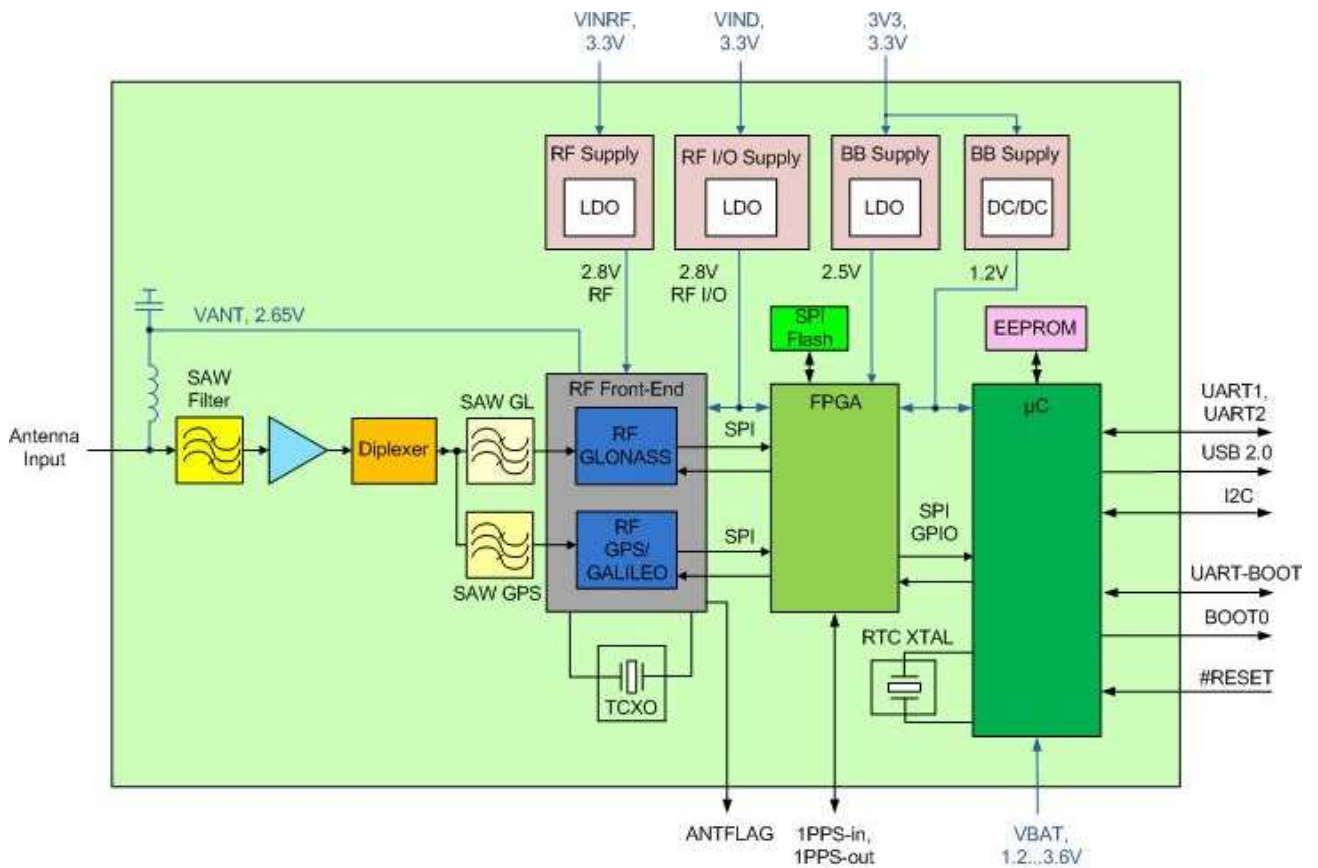


Figure 1 ACH-5206 block diagram

## **1.5 Using GNSS**

The ACH-5206 has dual-frequency RF front-end architecture, GLONASS concurrently with GPS and Galileo signals provide reception of three GNSS systems. Receiver provide reception signals of SBAS also. By default the ACH-5206 are configured for concurrent all systems. At by command of operator the receiver should be configured for a single GNSS using GPS, Galileo or GLONASS.

### **1.5.1 GPS**

The ACH-5206 are designed to receive the signals of Global Positioning System at 1575.42 MHz C/A code.

### **1.5.2 GALILEO**

The ACH-5206 are designed to receive the E1-B/C signals at the center frequency of GPS 1575.42 MHz. The useful GALILEO spectrum by additionally modulation is displaced in relation to the spectrum of the GPS so that there is no influence of one system on another. The signals of Galileo and GPS can be processed concurrently together with signals of GLONASS, enhancing coverage, reliability and accuracy.

### **1.5.3 GLONASS**

The ACH-5206 are designed to receive the L1OF signals GLONASS provides at  $1602 \text{ MHz} + k \cdot 562.5 \text{ kHz}$ , where  $k$  is the satellite's frequency channel number ( $k = -7, \dots, 5, 6$ ). The ability to receive and track GLONASS L1OF satellite signals allows design of GLONASS receivers where required by regulations.

## **1.6 Using Satellite-Based Augmentation System (SBAS)**

The ACH-5206 support reception of SBAS broadcast signals. These systems supplement GNSS data with additional regional or wide area GPS augmentation data. The system broadcasts range correction and integrity information via satellite which can be used by GNSS receivers to improve resulting precision. SBAS satellites can be used as additional satellites

## 1.7 Interfaces

The ACH-5206 interfaces are used to exchange of data and control commands.

### 1.7.1 UART

The ACH-5206 has three interfaces UART:

- UART BOOT and signal BOOT0;
- UART1;
- UART2.

The interface UART BOOT and signal BOOT0 are used to update the software.

The interfaces UART1 and UART2 are used to exchange of data and control commands.

### 1.7.2 USB 2,0

The interfaces USB 2,0 is used to exchange of data and control commands.

1.7.3 I2C is used to expanding functionality. That may be:

- increased numbers receive channel;
- integrate with sensors;
- external boot.

### 1.7.4 ANTFLAG

The signal ANTFLAG is indicated connection of antenna. The signal ANTFLAG is indicated connection of antenna, "1" connected, "0" – disconnected.

### 1.7.5 1PPS

There are two signals 1PPS:

- 1PPS in – input to external signal 1PPS;
- 1PPS out – output of internal signal 1PPS.



### 1.7.6 VBAT

The VBAT is input to DC voltage for RTC and internal RAM.

### 1.7.7 VINRF

The VINRF is input to DC voltage for RF Front End.

### 1.7.8 VIND

The VIND is input to DC voltage for digital unit of ACH-5206.

### 1.7.9 3V3

The 3V3 is input to DC voltage for peripheral units of ACH-5206.

### 1.7.10 #RESET

The signal #RESET is using to re-starting of digital unit of ACH-5206.

## 1.8 Oscillators

The ACH-5206 has a two oscillators:

- high stability TCXO;
- standard stability XTAL.

The TCXO is used to find signals of GNSS satellites in RF Front End. His nominal frequency is 26 MHz and non stability  $\pm 0.5$  ppm.

The XTAL has nominal frequency 32 kHz.

## 1.9 Antenna

The ACH-5206 is designed for use with active antennas. Min gain of antenna must be 12 dB. Max gain of antenna must be 32 dB. The DC power to antenna is produced from IC MAX2769 and have max 57 mA.

# 2 Hardware reference

## 2.1 Package

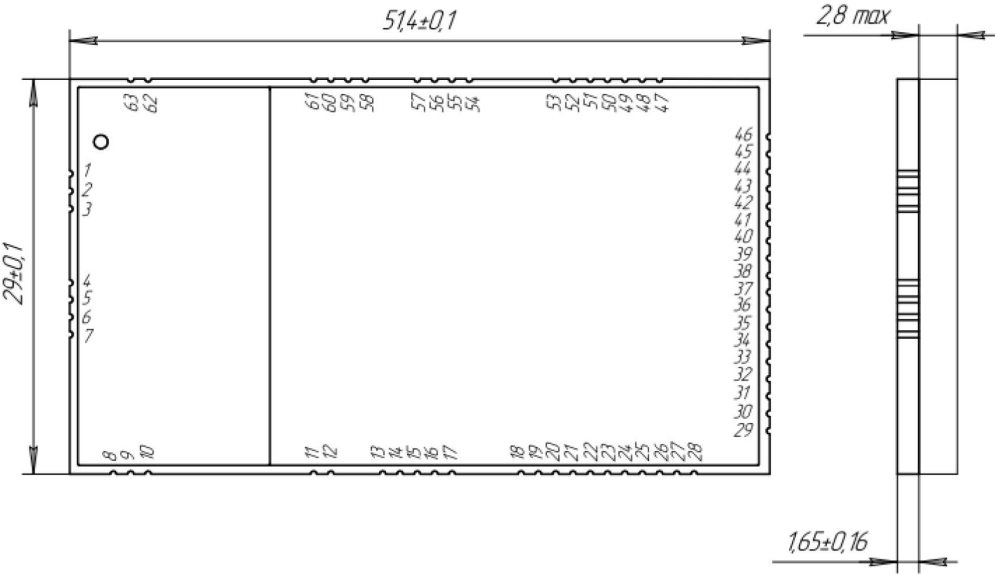


Figure 2 Dimensions ACH-5206

## 2.2 Pin definition

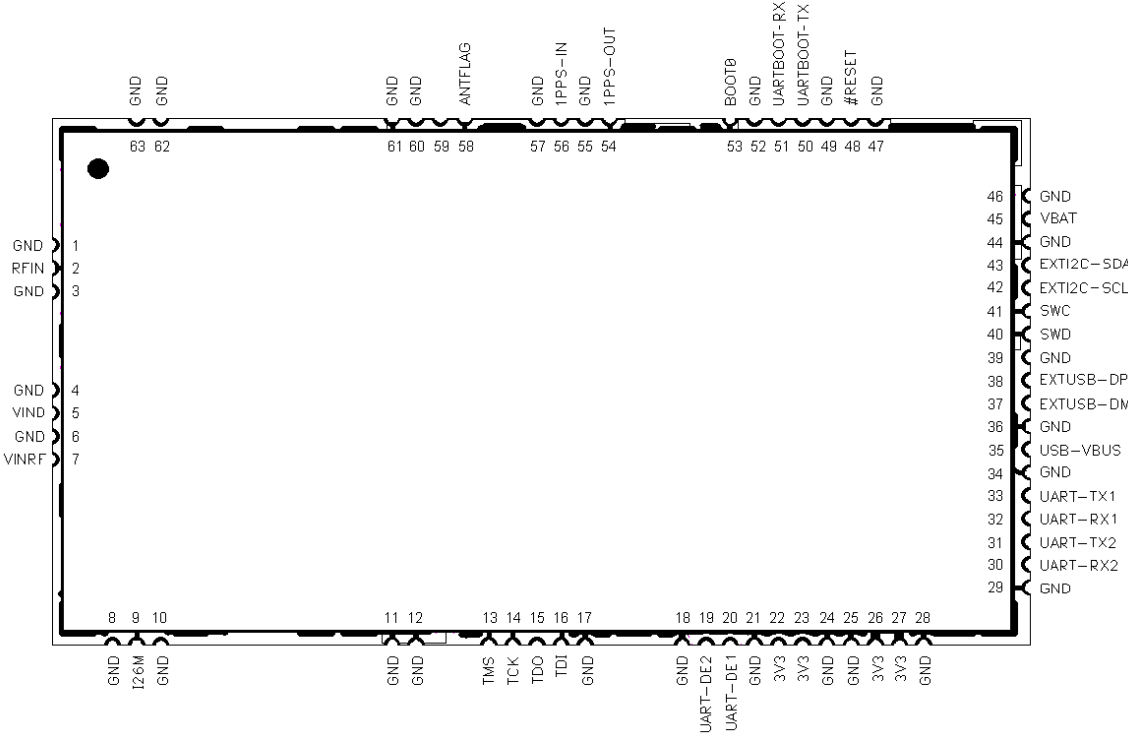


Figure 3 Drawing ACH-5206. Top view

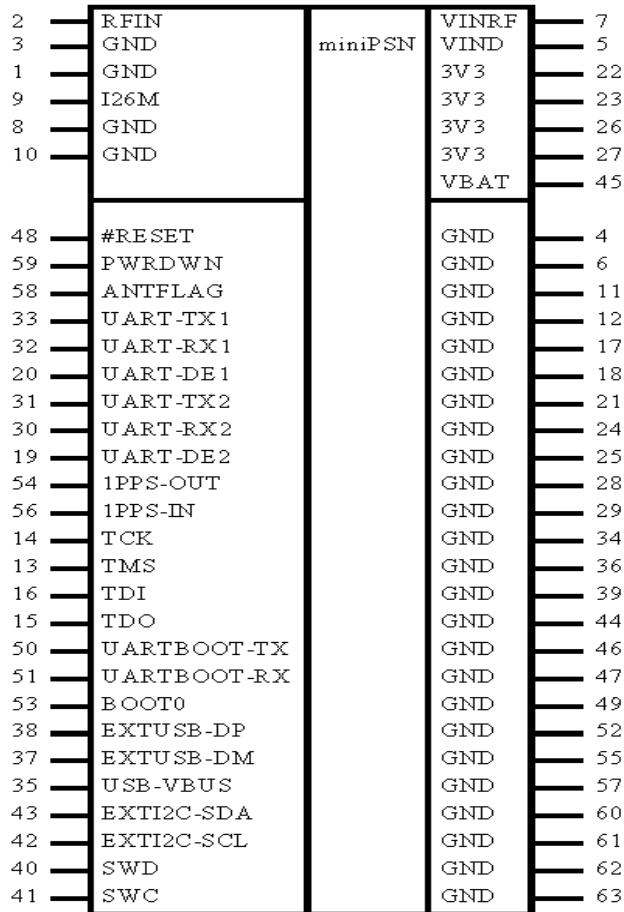


Figure 4 Pinout ACH-5206

Table 3 provides list of pins, along with their signal name, pin number, pin type and description.

Table 3

Name	Description	Name	Description
1 GND	Ground RF frontend	33 UART-TX1	Output UART 1
2 RFIN	Input RF frontend	34 GND	Ground digital unit
3 GND	Ground RF frontend	35 USB-VBAS	Input DC power USB
4 GND	Ground digital unit	36 GND	Ground digital unit
5 VIND	Input DC power digital unit	37 EXT-USBDM	«-» DATA USB
6 GND	Ground digital unit	38 EXT-USBDP	«+» DATA USB
7 VINRF	Input DC power RF frontend	39 GND	Ground digital unit
8 GND	Ground RF frontend	40 SWD	Technologic input
9 I26M	Input external reference 26 MHz	41 SWC	Technologic input

Name	Description	Name	Description
10 GND	Ground RF frontend	42 EXT-I2C SCL	Input/output clock line
11 GND	Ground digital unit	43 EXT-I2C SDA	Input/output data line
12 GND	Ground digital unit	44 GND	Ground digital unit
13 TMS	Technologic input	45 VBAT	Input VDC for RTC RAM
14 TCVINDK	Technologic input	46 GND	Ground digital unit
15 TDO	Technologic input	47 GND	Ground digital unit
16 TDI	Technologic input	48 #RESET	Input re-start of digital unit
17 GND	Ground digital unit	49 GND	Ground digital unit
18 GND	Ground digital unit	50 UARTBOOTTX	Output UART to update SW
19 UART DE2	RS485 interface transmitter output control signal for UART1	51 UARTBOOTRX	Input UART to update SW
20 UART DE2	RS485 interface transmitter output control signal for UART2	52 GND	Ground digital unit
21 GND	Ground digital unit	53 BOOT0	Signal to update SW
22 3V3	Input DC power peripheral unit	54 1PPS-OUT	Output 1PPS signal
23 3V3	Input DC power peripheral unit	55 GND	Ground digital unit
24 GND	Ground digital unit	56 1PPS-IN	Input IPPS external signal
25 GND	Ground digital unit	57 GND	Ground digital unit
26 3V3	Input DC power peripheral unit	58 ANTFLAG	Output indication antenna
27 3V3	Input DC power peripheral unit	59 PWRDWN	Technologic input
28 GND	Ground digital unit	60 GND	Ground digital unit
29 GND	Ground digital unit	61 GND	Ground digital unit
30 UART-RX2	Input UART 2	62 GND	Ground digital unit
31 UART-TX2	Output UART 2	63 GND	Ground digital unit
32 UART-RX1	Input UART 1		

## 3 Configuration management

### 3.1 Default parameters

Table 4

Parameter	Default	Variable
1 Temp to «FIX»	1 Hz	2, 5, 10,20 Hz
2 UART1	BINR2, 115200 bode	NMEA-0183, RTCM
3 UART2	NMEA-0183, 115200 bode	BINR2, RTCM
4 Min angle satellite	5°	0...45°
5 Coordinate system	WGS-84	PZ-90.02, user
6 GNSS	GPS, GALILEO, GLONASS	Any combination
7 Min s/n	27 dB	>27
8 Dynamic filter	3	0...10

### 3.2 Configuration setting

Configuration settings can be modified with BINR2 messages. These settings may be stored in RAM if VBAT is on. BINR2 messages are describe in a other document.

### 3.3 Information messages

The ACH-5206 are used messages:

- BINR2
- NMEA-0183
- RTCM-2,3 RTCM-3,0

BINR2 has original messages.

NMEA-0183, RTCM-2,3 and RTCM-3.0 are standard messages with addition information about GLONASS and GALILEO satellites.

## 4 Electrical specification

### 4.1 Absolute maximum rating

Table 5

Parameter	Symbol	Condition	Min	Max	Units
Input DC power digital unit	VIND		-0,5	3,6	V
Input DC power RF frontend	VINRF		-0,5	3,6	V
Input DC power peripheral unit	3V3		-0,5	3,6	V
Input VDC for RTC RAM	VBAT		-0,5	3,6	V
Input DC power USB	USB-VBAS		-0,5	3,6	V
Input UART	UART-RX		-0,5	3,3+0,5	V
Output UART	UART-TX			10	mA
Input RF frontend	RFIN	impedance = 50Ω, continuous wave		15	dBm
VCC_RF output current	RFIN			100	mA

The ACH-5206 is not protected against overvoltage or reversed voltages. If necessary, voltage spikes exceeding the power supply voltage specification, given in table above, must be limited to values within the specified boundaries by using appropriate protection diodes.

## 4.2 Operating conditions

All specifications are at an ambient temperature of 25 °C.

Table 6

Parameter	Symbol	Min	Typical	Max	Units	Condition
Input DC power digital unit	VIND	3,15	3,3	3,45	V	note 1
Input DC power RF frontend	VINRF	3,15	3,3	3,45	V	note 1
Input DC power peripheral unit	3V3	3,15	3,3	3,45	V	note 1
Input VDC for RTC RAM	VBAT	1,2		3,6	V	
Backup battery current				2,5 20	mkA	RTC on, BackupSRAM on +25 °C +85 °C
Input DC power USB	USB-VBAS	4,4	5	5,25	V	note 1
Input voltage Low level		0		0,3*3V3	V	
Input voltage High level		0,7*3V3		3V3	V	
Output voltage Low level				0,4	V	4 mA
Output voltage High level		3V3-0,4			V	4 mA
Noise figure			2,0		dB	
Operating temperature		-40		85	°C	

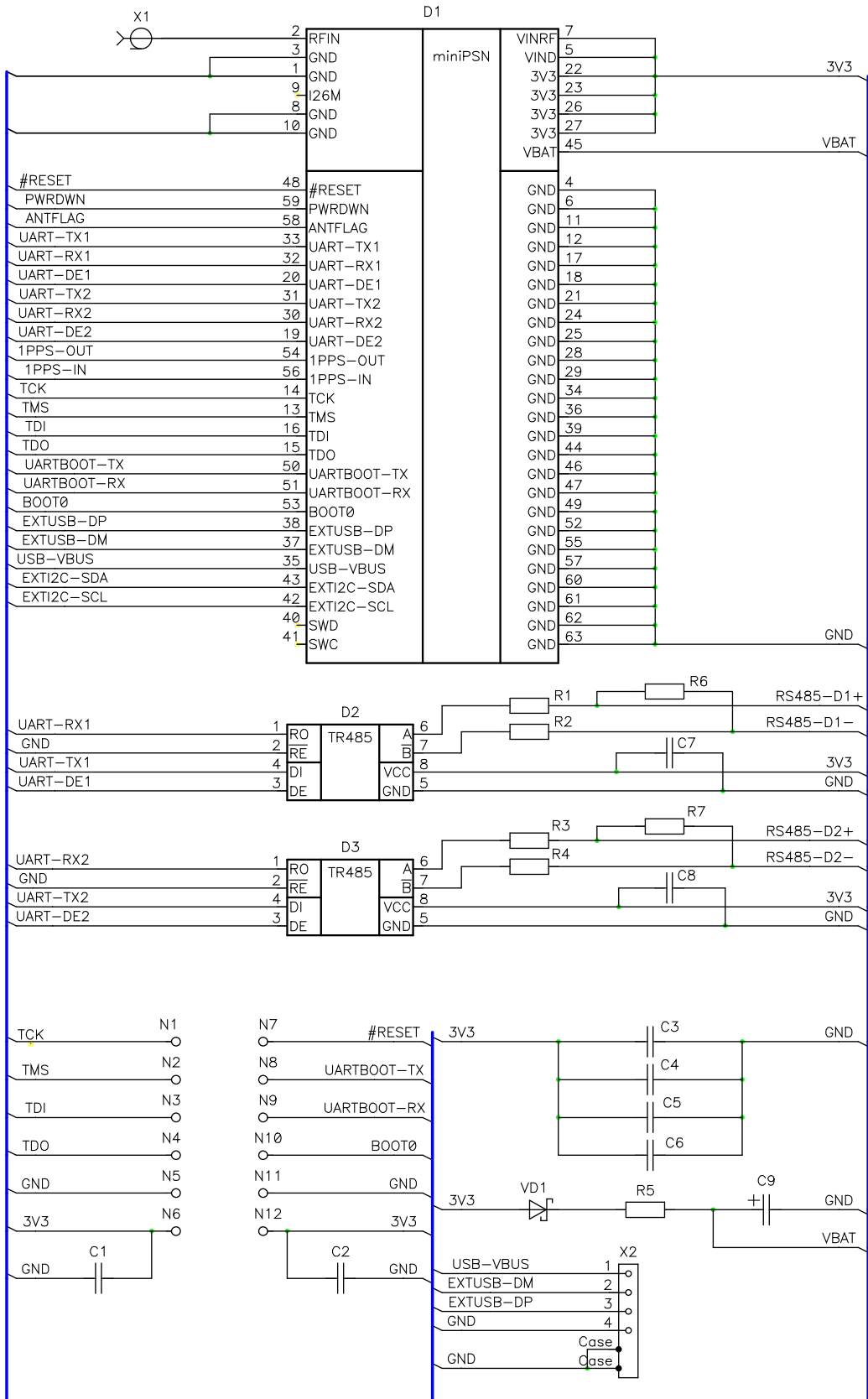
Note 1

Power supply ramp time 5... 50 ms, recommended – 10 ms.

## 4.3 Indicative current requirements

Max supply current ACH-5206 is 246 mA at 3,3V by all nets (GPS+GALILEO+GLONASS).

# 5 Typical scheme of application





<b>Position</b>	<b>Name</b>	<b>Manufacturer</b>
C1, C2	Capacitor CL10B224KO8NNNC	Samsung Electro- Mechanics
C3...C6	Capacitor CL21A225KAFNNNG	Samsung Electro- Mechanics
C7, C8	Capacitor CL10B224KO8NNNC	Samsung Electro- Mechanics
C9	Capacitor EECF5R5U155	Panasonic Electronic Components
D1	Satellite receiver AEAO.468173.002	DB CENTRE
D2, D3	Integrated circuit MAX485EESA	Maxim
N1...N12	Pin	
R1...R4	Resistor RC0603JR-0710RL	Yageo
R5	Resistor RC0805JR-07120RL	Yageo
R6, R7	Resistor RC0805JR-07120RL	Yageo
VD1	Diode BAT54-7-F	Diodes Incorporated
X1	Connector MMCX-73415-2063	MOLEX
X2	Connector DS1099-W	Connfly

Figure 5 Typical scheme of application

## 6 Mechanical specifications

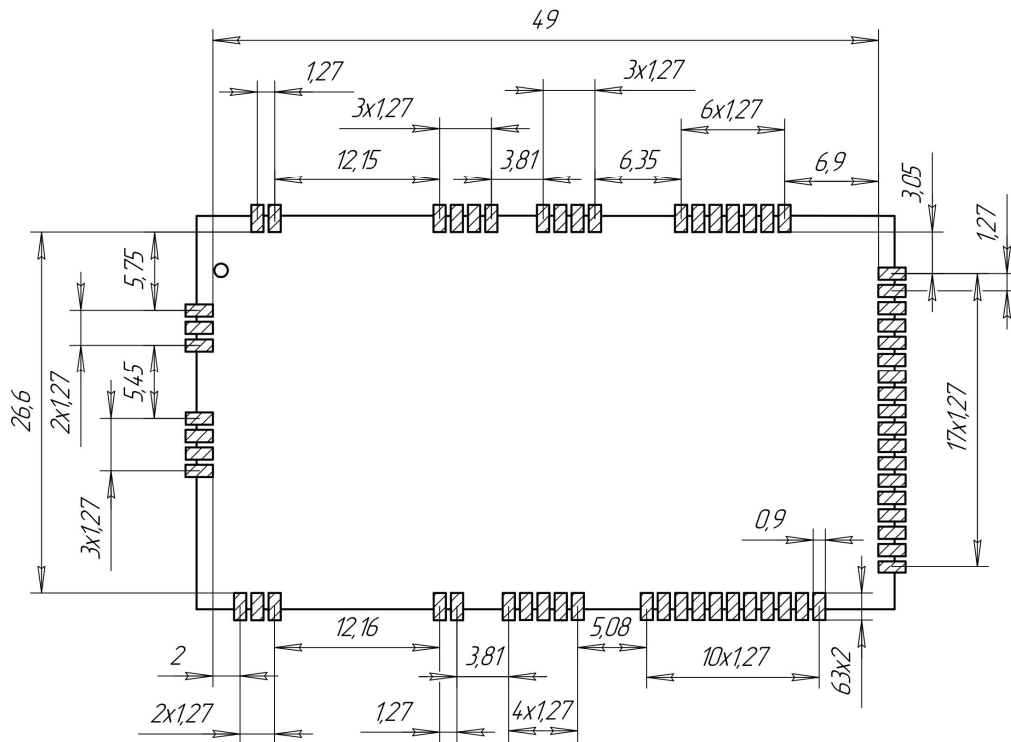


Figure 6 Pin drawing of ACH-5206

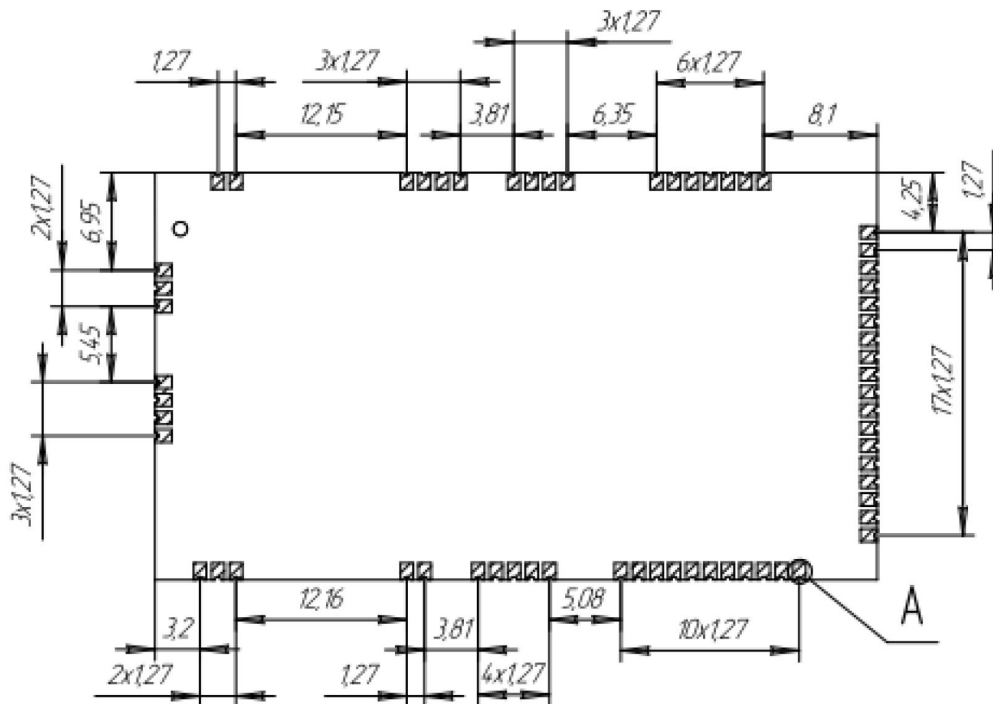


Figure 7 Pin drawing of board

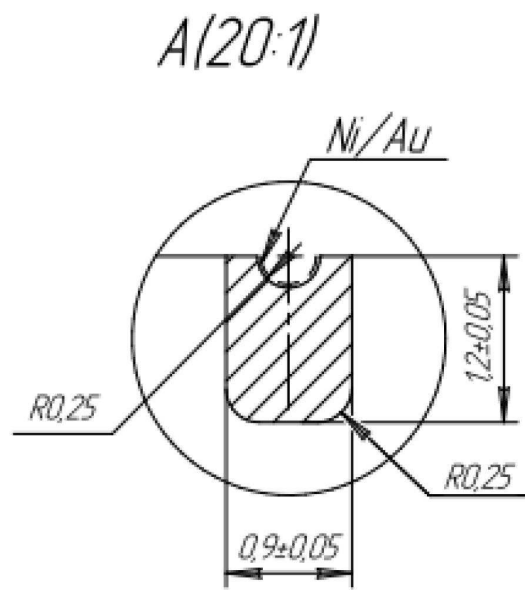


Figure 8 Drawing of pin

## 7 Reliability tests and approvals

### 7.1 Reliability tests

ACH-5206 is designed and produced according to KT-34-01 "Satellite navigation onboard equipment. Qualification requirements".

### 7.2 Approvals



Products marked with this lead-free symbol on the product label comply with the "Directive 2002/95/EC of the European Parliament and the Council on the Restriction of Use of certain Hazardous Substances in Electrical and Electronic Equipment" (RoHS).

## 8 Default messages

ACH-5206 provide default messages in NMEA-0183:

- ALVER;
- GGA;
- GNS;
- GSA;
- GSV;
- PORZD;
- RMC.