GNSS Positioning Module

WKG0184T06Y01

User Manual

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1. Functional Description

1.1. Overview

WKG0184T06Y01 is a high-performance, low-power multi-GNSS navigation and positioning module. It is equipped with the AT6850-7N76 SoC, the 8th-generation low-power chipset from Zhongke Micro. This chipset integrates an RF front-end, digital baseband, multi-constellation signal processing engine, and power management unit, resulting in high integration and simplified external circuitry.

WKG0184T06Y01 supports GNSS signal reception in the L1 frequency band, including China's BDS (BeiDou Navigation Satellite System), the U.S. GPS, Russia's GLONASS, and the EU's Galileo. It enables both single-system positioning and multi-constellation positioning. The module supports BeiDou-2 and BeiDou-3, and allows standalone BeiDou positioning and timing.

With advantages such as high sensitivity, low power consumption, and cost-effectiveness, the WKG0184T06Y01 is well suited for applications including vehicle positioning and navigation, power system timing, 4G/5G communication timing, and IoT positioning devices.

1.2. Key Features

- WKG0184T06Y01 supports both single-constellation (BDS or GPS) and multi-constellation positioning. It is configurable to operate with any single GNSS system or in combined modes, including BDS, GPS, GLONASS, and Galileo.
- Supports A-GNSS for fast cold start and rapid positioning under weak signal conditions
- Cold start sensitivity: -148 dBm
- Hot start sensitivity: -156 dBm
- Reacquisition sensitivity: -160 dBm
- Tracking sensitivity: -162 dBm
- Position accuracy: 1.5m (CEP50)
- TTFF: ≤23s
- Low power consumption (~30mA @5V)
- Built-in 18×18×2mm ceramic antenna(customization size available)
- Integrated LNA
- Fast hot start (<1s) with onboard capacitor
- Standard NMEA-0183 output

1.3. Applications

- Vehicle navigation and tracking
- Power timing / 4G/5G synchronization
- IoT positioning devices
- UAV (drones)
- Portable devices

1.4. Assisted GNSS

Supports A-GNSS, providing assistance data such as ephemeris, approximate position, and time.

This significantly reduces Time-To-First-Fix (TTFF), even in weak signal environments.

1.5. Output Protocol

The module outputs data via UART interface using NMEA-0183 protocol.

1.6. Performance Specifications

Parameter	Specification
Signal Reception	BDS/GPS/GLONASS/Galileo
RF Channels	52
Cold Start TTFF	≤23s
Hot Start TTFF	≤1s
Reacquisition TTFF	≤1s
Cold Start Acquisition Sensitivity	-148dBm
Hot Start Acquisition Sensitivity	-156dBm
Reacquisition Sensitivity	-160dBm
Tracking Sensitivity	-162dBm
Positioning Accuracy	<1.5m (CEP50)
Velocity Accuracy	<0.05m/s (1σ)
Update Rate	1Hz (max 5Hz)

Baud Rate	4800bps-115200bps, 115200 bps (default)
Interface Protocol	NMEA0183
Maximum Altitude	18000m
Maximum Velocity	500m/s
Power Supply	3.3V – 5.5V
Power Consumption	~30mA @5V
Operating Temperature	-40℃ to +85 ℃
Storage Temperature	-40℃ to +85 ℃
Dimensions	18x18x4.2mm (PCB 0.8mm，antenna 2.0mm，Shielding Cover 1.4mm)

2. Product Description

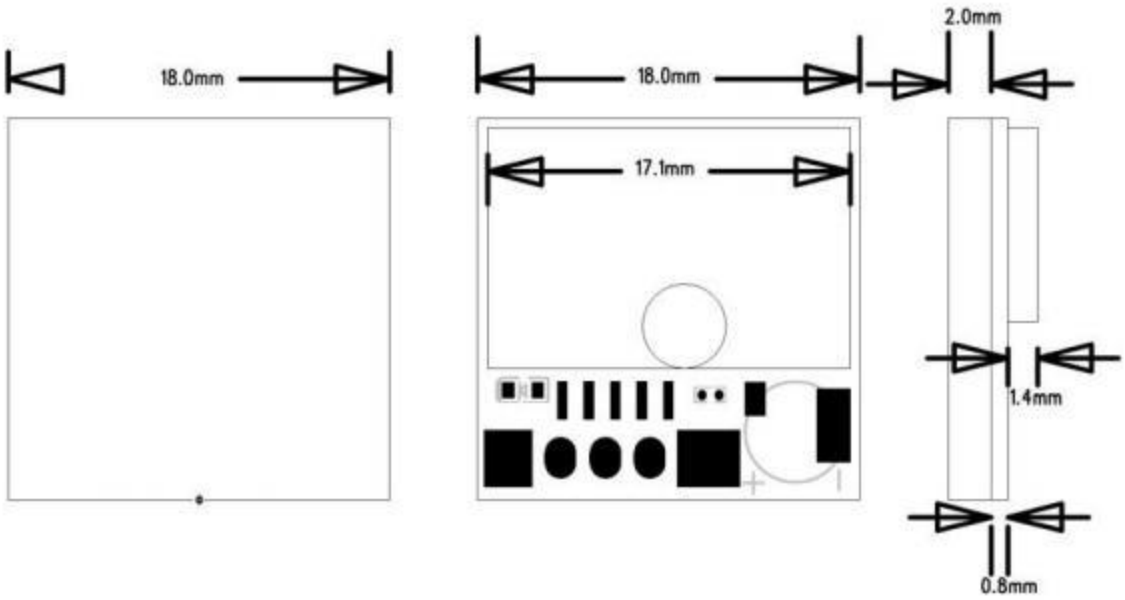
2.1. Module Appearance

Front

Back

- The front side of the module features an 18 × 18 × 2 mm ceramic antenna (customization sizes available).
- The back side of the module is equipped with a 17.1 × 11.35 × 1.4 mm shielding cover.
- A supercapacitor is integrated on the back side to provide backup power for the internal chip, ensuring fast positioning during hot start.
- The back side includes a 5-pin 1.25 mm connector (pin from left to right: GND, RX, TX, 5V, PPS), and is also compatible with a 4-pin 1.25 mm connector (without 1PPS), as well as 5-pin solder pads (pin from left to right: GND, RX, TX, 5V, GND)

2.2. Dimensions



Top View Bottom View Side View

- The dimensions is 18x18x4.2mm (PCB 0.8mm, Antenna 2.0mm, Shielding Cover 1.4mm)
- The connector pad pitch is 1.25 mm
- The solder pad pitch is 2.1 mm
- The ceramic antenna dimensions are 18 × 18 × 2 mm
- The shielding cover dimensions are 17.1 × 11.35 × 1.4 mm
- The opening radius of the shielding cover is 2 mm

2.3. Pin Definition

Pin	Type	Description
5V	P	Power supply，3.3-5.5V
TX	IO	UART/TTL output
RT	IO	UART/TTLinput
1PPS	IO	1PPS Output
GND	P	Ground

3. Electrical Characteristics

3.1. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Voltage	VDD	-0.3	5.5	V
Digital I/O Voltage Level	Tx/Rx/PPS	-0.3	4.1	V
ESD Protection (HBM)	VESD(HBM)	-	2000	V

3.2. Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VDD	3.3	5	5.5	V
Input Voltage	Vil	-0.3	-	0.6	V
	Vih	2.8	-	3.6	V
Output Voltage	Vol	-	-	0.4	V
	Voh	2.8		3.3	V
Antenna Protection Current (Auto)	Iant short	40	50	70	mA
Average Operating Current	Io @VDD=5V	-	30	-	mA
Operating Temperature	Temp	-40	-	85	℃

4. NMEA Protocol

4.1. NMEA Protocol Characteristics

WKG0184T06Y01 GNSS module complies with the international standard NMEA 0183 protocol, as well as a proprietary binary protocol.

The module outputs positioning data such as longitude, latitude, and time via the NMEA 0183 protocol. The proprietary binary protocol is used for module configuration, including parameters such as update rate, baud rate, etc.

Data is transmitted via an asynchronous serial interface. The transmission format consists of a start bit, followed by data bits. The data bits are transmitted in least significant bit (LSB) first order.

Data transmission format:

Start Bit	D0	D1	D2	D3	D4	D5	D6	D7	Stop Bit

Data Transmission Parameters：

Baud Rate (bps)	Default 115200bps
Data Bits	8bits
Stop Bit	1bits
Parity Bit	/

4.2. Frame Structure

NMEA Frame Structure				
	Checksum Calculation Range			
$	<Address >	{, <Data >}	*<Checksum >	<CR><LF>
Start Delimiter	Address Field	Data Field	Checksum Field	End Sequence
Each sentence begins with '$'	Consists of two parts: Talker ID and Sentence Type	As☑Begins, contains variable-length or fixed-length data fields	XOR result of all characters between '$' and '*', represented in hexadecimal	Each sentence ends with <CR><LF>

4.3. NMEA Identifiers

NMEA distinguishes different GNSS modes by transmitting different talker IDs, as shown below:

System	ID
BDS	BD
GPS SBAS QZSS	GP
GLONASS	GL
GNSS	GN
Proprietary Information	P

4.4. Support Messages

WKG0184T06Y01 supports the following message fields. When multi-GNSS positioning is used, the talker identifier “GN” is applied; otherwise, a single-system identifier is used.
An overview of the supported NMEA messages is as follows:

Message	Class/ID	Description
NMEA Standard Message		Standard Message
GGA	0x4E 0x00	Receiver Position Data
GLL	0x4E 0x01	Geographic Position – Latitude / Longitude
GSA	0x4E 0x02	Dilution of Precision (DOP) and Active Satellites
GSV	0x4E 0x03	Satellites in View
RMC	0x4E 0x04	Recommended Minimum Specific GNSS Data
VTG	0x4E 0x05	Speed Over Ground and Course Over Ground
GST	0x4E 0x07	Receiver Pseudorange Error Statistics
ZDA	0x4E 0x08	Time and Date
ANT	0x4E 0x11	Antenna Status
LPS	0x4E 0x12	GNSS System Leap Second Correction Information
DHV	0x4E 0x13	Receiver Velocity Information
UTC	0x4E 0x16	Receiver Status and Simplified Leap Second Correction Information
NMEA Proprietary Messages		Proprietary Messages
CAS00	-	Save Configuration Parameters
CAS01	-	Communication Protocol and UART Configuration
CAS02	-	Set Positioning Update Rate
CAS03	-	Enable or Disable Message Output and Configure Output Frequency
CAS04	-	Set System Initialization and Channel Configuration
CAS05	-	Set NMEA Talker Identifier
CAS06	-	Query Module Software and Hardware Information
CAS10	-	Startup Mode and Assisted Data Configuration
CAS12	-	Standby Mode Control
CAS20	-	Firmware Upgrade Command (OTA Supported)

Among all supported NMEA messages, RMC is the most commonly used. It provides essential information including longitude, latitude, UTC time, and positioning status.

The TXT message provides additional information such as manufacturer identification, software and hardware versions, firmware release date, and antenna status (open, connected, or short circuit).

5. Contact Us

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