

Tkbm01BLECL5.0 Product Specification Document



product presentation

Product Overview

- The module integrates high-precision gyroscopes, accelerometers, and geomagnetic field sensors, utilizing a high-performance microprocessor along with advanced dynamic simulation algorithms and Kalman filtering techniques to rapidly determine the module's real-time motion attitude.
- By employing advanced digital filtering technology, it effectively reduces measurement noise and enhances measurement accuracy.
- The module integrates a pose resolver combined with a dynamic Kalman filtering algorithm, enabling precise determination of the current orientation in dynamic environments with an accuracy of 0.2 degrees and exceptional stability—outperforming even certain professional inclinometers!
- The module features a built-in voltage stabilization circuit with an operating voltage range of 3.3 V to 5 V, and its pin voltages are compatible with both 3.3 V and 5 V embedded systems, ensuring easy connectivity.
- The high-performance Cortex-M4 core processor operates at a clock frequency of up to 168 MHz, delivering both low power consumption and superior performance.
- Bluetooth BLE 5.0 wireless transmission with stable performance and a range of up to 50 meters.

Product Features

- The module integrates high-precision gyroscopes, accelerometers, and geomagnetic field sensors, utilizing a high-performance microprocessor along with advanced dynamic simulation algorithms and Kalman filtering techniques to rapidly determine the module's real-time motion attitude.
- By employing advanced digital filtering technology, it effectively reduces measurement noise and enhances measurement accuracy.
- The module integrates a pose resolver combined with a dynamic Kalman filtering algorithm, enabling precise determination of its current orientation in dynamic environments with an accuracy of 0.2° and exceptional stability—outperforming even certain professional inclinometers.
- The X-axis heading angle incorporates geomagnetic sensor-based filtering and fusion, addressing the cumulative error caused by gyroscope integration drift in the 6-axis algorithm and enabling long-term stable output of heading angle data. **Note: Due to magnetic field detection, calibration is required before use; during operation, maintain a distance of at least 20 cm from magnetic interference sources, electronic devices, magnets, speakers, and other hard magnetic objects.**
- Operating current: $\approx 15\text{ mA}$; Broadcast current: $\approx 150\text{ }\mu\text{A}$; Standby current: $10\text{--}50\text{ }\mu\text{A}$.
- Data Interface: baud rate 115,200.
- Data output frequency: 0.2 Hz to 200 Hz; for data packet transmission, 50 Hz to 200 Hz is used, with 10 Hz as the default.
- Bluetooth 5.0: Compatible with Android and iOS operating systems (actual functionality may vary depending on the device model)

Parameter Indicator

Accelerometer Parameters

parameter	condition	representative value
range		$\pm 16\text{g}$
resolution ratio	$\pm 16\text{g}$	$0.0005(\text{g/LSB})$

sampling rate		2KHz
RMS noise	Bandwidth = 100 Hz	0.75~1mg-rms
Static Zero Drift	horizontal arrangement	$\pm 20\sim 40\text{mg}$
Thermophilic	$-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$	$\pm 0.15\text{mg}/^{\circ}\text{C}$
tape width		5~256Hz

Gyroscopic Parameters

parameter	condition	representative value
range		$\pm 2000^{\circ}/\text{s}$
resolution ratio	$\pm 2000^{\circ}/\text{s}$	$0.061(^{\circ}/\text{s})/(\text{LSB})$
sampling rate		2KHz
RMS noise	Bandwidth = 100 Hz	$0.028\sim 0.07(^{\circ}/\text{s})\text{-rms}$
Static Zero Drift	horizontal arrangement	$\pm 0.5\sim 1^{\circ}/\text{s}$
Thermophilic	$-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$	$\pm 0.005\sim 0.015 (^{\circ}/\text{s})/^{\circ}\text{C}$
tape width		5~256Hz

Magnetometer Parameters

parameter	condition	representative value
range		$\pm 2\text{Gauss}$
resolution ratio	$\pm 2\text{Gauss}$	0.0667mGauss/LSB

Tilt, Roll Angle Parameters

parameter	condition	representative value
range		X: $\pm 180^\circ$
		Y: $\pm 90^\circ$
Inclination Accuracy		0.2°
resolution ratio	horizontal arrangement	0.0055°
Thermophilic	$-40^\circ\text{C} \sim +85^\circ\text{C}$	$\pm 1^\circ$

Course Angle Parameter

parameter	condition	representative value
range		Z: $\pm 180^\circ$

Course Accuracy	9-axis algorithm, magnetic field calibration, dynamic/static	1° (under conditions without magnetic field interference) 【1】
	6-axis algorithm, static	0.5° (dynamic integral accumulation error exists) 【2】
resolution ratio	horizontal arrangement	0.0055°

remark:

【1】 Before use, perform magnetic field calibration in the test environment to ensure the sensor is familiar with the local magnetic field conditions. During calibration, maintain a distance from magnetic interference sources. **【2】** In vibrating environments, cumulative errors may occur; the exact magnitude cannot be determined and should be verified during actual testing.

Module Parameters

essential parameter

parameter	condition	least value	give tacit consent to	crest value
CI	UART	115200bps	115200bps	115200bps
Output Content		3-axis acceleration, 3-axis angular velocity, 3-axis magnetic field, 3-axis angle, quaternion, port status		
output speed		0.2Hz	10Hz	200Hz

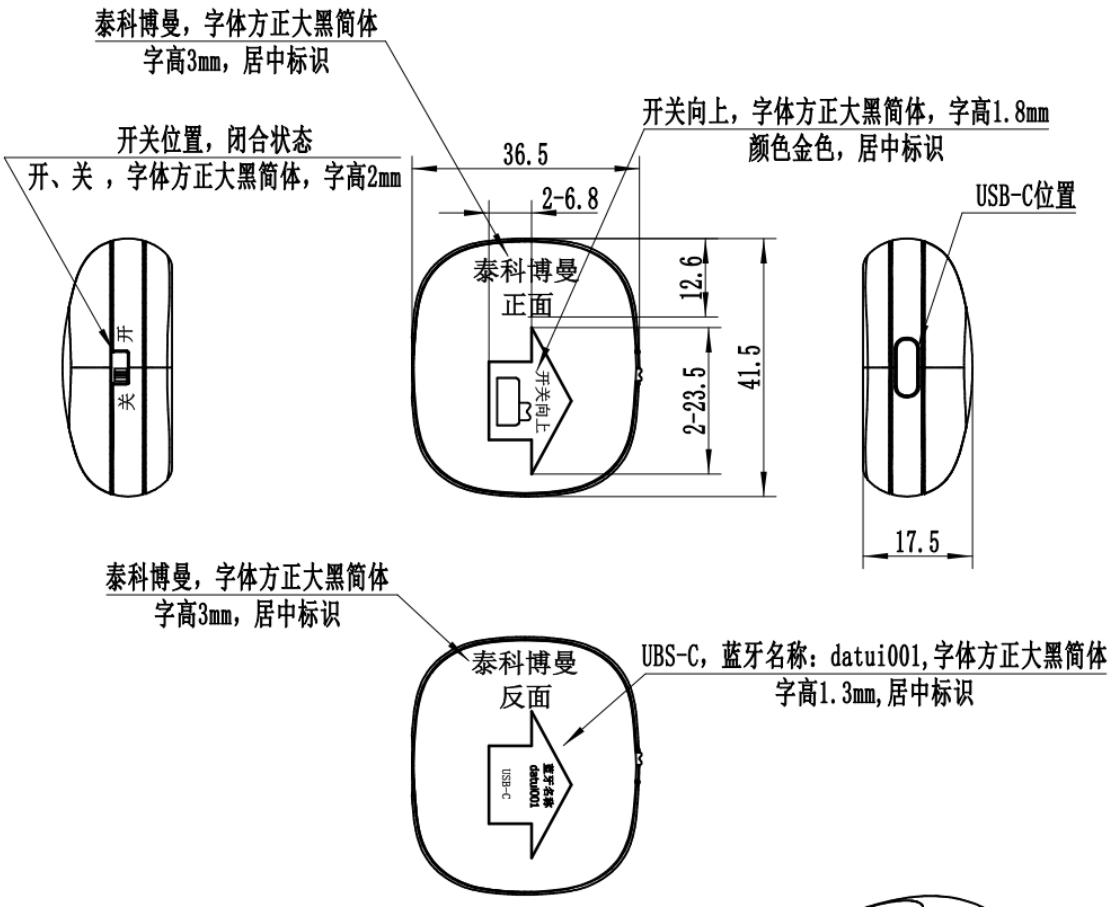
start time				1000ms
Number of Cascades	Computer Bluetooth			4
Bluetooth Transmission Range	Open Environment			50m
weight			18.88g	
working temperature		-20°C		60°C
Storage Temperature		-40°C		85°C
impact resistance				20000g

Electrical Parameters

parameter	condition	least value	give tacit consent to	crest value
charging voltage			5V	
cell voltage			3.7V	
Working Current	10HZ		15mA	
Radio Current			150uA	
Standby current			50uA	
battery capacity			200mAH	

power dissipation			55.5mW	
working hours			30 hours	
Charging Time		2 hours		3 hours

product size



Interface Definition

interface specification



Interface Name	interface function
TYPE-C	Charging and Serial Output 【1】

remark :

【1】 Supports TYPE-C connectivity for data viewing on PCs; the CH340 driver must be installed on the PC.

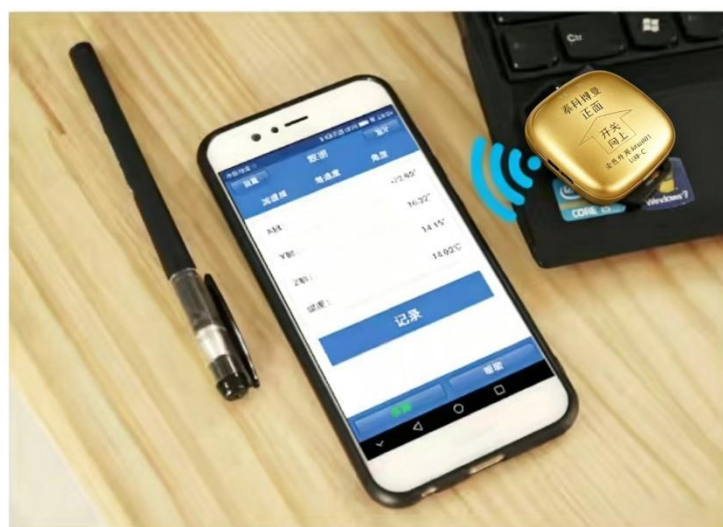
Connect the Bluetooth adapter to your computer



remark :

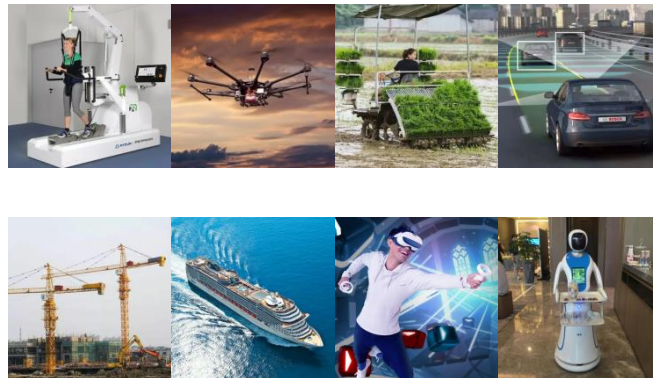
【1】 When using a Bluetooth 5.0 USB adapter, you must use the corresponding host computer.

Bluetooth wireless connection for Android phones



application area

- Virtual Reality/Augmented Reality, Head-Mounted Display
- Large-scale agricultural mechanization for automatic cultivation
- Safety Monitoring for Work at Altitude
- Drone, a manned aircraft
- Industrial Posture Monitoring
- Human Motion Tracking/Capture
- Robot, automated guided vehicle
- Pedestrian Navigation
- Unmanned Driving/Autonomous Driving Systems



FCC Warning:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Caution: Any changes or modifications to this device not explicitly approved by manufacturer could void your authority to operate this equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 0cm between the radiator and your body.