

BS-IU64-M-D6EC

Inertial Measurement Unit User Manual

Update the record

Pr ef ac e N u m b e r	Edit ion Ben	Change Date	Before the change	After the change	Change Reason	Change d by
1	1.00	20220908		New establishment	New establishm ent	fyg

1. Product overview

BS-IU64-M-D6EC is an inertial measurement unit (IMU) based on micro-mechanical technology (MEMS), with built-in high-performance MEMS gyroscope and MEMS accelerometer, outputting 3 angular velocities and 3 accelerations.

BS-IU64-M-D6EC has high reliability and strong environmental adaptability. By matching different software, the product can be widely used in intelligent driving, tactical and industrial UAV, intelligent ammunition, seeker, mobile communication, mapping, stable platform and other fields.

2. Product features

- 1) Three-axis digital gyroscope:
 - a) $\pm 250^\circ/\text{s}$ dynamic measurement range (configurable $\pm 500^\circ/\text{s}$);
 - b) Bias stability (GJB, 10S, typical value): X axis, y axis: $6^\circ/\text{H}$; Z axis: $5^\circ/\text{H}$;
 - c) Bias instability (ALLAN, typ.): $3.5^\circ/\text{H}$ X, y; $3^\circ/\text{H}$ Z;
- 2) Triaxial digital accelerometer:
 - a) $\pm 4\text{ G}$ dynamic measurement range (configurable $\pm 16\text{ G}$);
 - b) Bias stability (GJB, 10S, typical value): 0.1mg ;
 - c) Bias instability (ALLAN, typical value): 0.055mg ;
- 3) High reliability: MTBF > 20000h;
- 4) Guaranteed accuracy within the full temperature range ($-40^\circ\text{C} \sim 80^\circ\text{C}$): built-in high-performance temperature calibration and compensation algorithm;
- 5) Suitable for working under strong vibration conditions;
- 6) Interface 1-way UART.

3. Field of application

- 1) Intelligent driving
- 2) Tactical and Industrial UAV
- 3) Smart Munitions
- 4) Seeker
- 5) Communication in motion
- 6) Mapping
- 7) Stabilize the platform

4. Product indicators

表1. Product indicators

Parameter	Test conditions	Minimum value	Typical value	Maximum value	Unit	
Gyro	Dynamic measuring range		250	500	$^\circ/\text{s}$	
	Bias stability	Allan variance: x-axis, y-axis		3.5	4.5	$^\circ/\text{h}$
		Allan variance: z-axis		3	4	$^\circ/\text{h}$
		The x-axis, y-axis, 10 s average ($-40^\circ\text{C} \sim +80^\circ\text{C}$, constant temperature)		6	8	$^\circ/\text{h}$
		Z-axis 10 s average ($-40^\circ\text{C} \sim +80^\circ\text{C}$, constant temperature)		5	7	$^\circ/\text{h}$
Bias	Bias range		± 0.1		$^\circ/\text{s}$	
	Bias variation over full temperature		± 0.2		$^\circ/\text{s}$	

Parameter		Test conditions	Minimum value	Typical value	Maximum value	Unit
Scale factor	Bandwidth	range EQ \ o \ AC (o, 1) Scale factor accuracy Scale factor nonlinearity		0.15		%
				0.015		%FS
Accelerometer	Dynamic measuring range	Allan variance 10 s average (-40 °C ~ + 80 °C, constant temperature) Bias range Bias change in full temperature range, peak-to-peak value EQ \ o \ AC (o, 1) Scale factor accuracy Scale factor nonlinearity		4	16	g
	Bias stability			0.055	0.06	mg
	Bias			0.1	0.12	mg
	Scale factor			±1.5		mg
	Bandwidth			±3		mg
				0.3		%
				0.03		%FS
Communication interface	1-way UART	Baud rate		115.2	460.8	Kbps
	Sampling frequency	UART		200	1000	Hz
Electrical characteristics	Voltage		4.5	5	5.5	V
	Power consumption				0.4	W
	Ripple			P-P		20
Structural characteristics	Size			22.4×22.4×1		mm
	Weight			0.54		g
				20		
Use environment	Operating temperature			-40	80	°C
	Storage temperature			-45	85	°C
	Vibration			20~2000Hz □3g		
	Impact			1000g□0.5ms		
Reliability	MTBF			20000		h
	Continuous working time			120		h

: Calculate the zero deviation of the whole temperature change process, the temperature change rate is ≤ 1 °C/min, and the temperature range is -40 °C ~ + 80 °C;

5. Electrical interface

The schematic diagram of BS-IU64-M-D6EC interface definition is shown in the figure below, and the pin definition and specific functions are shown in the table below.

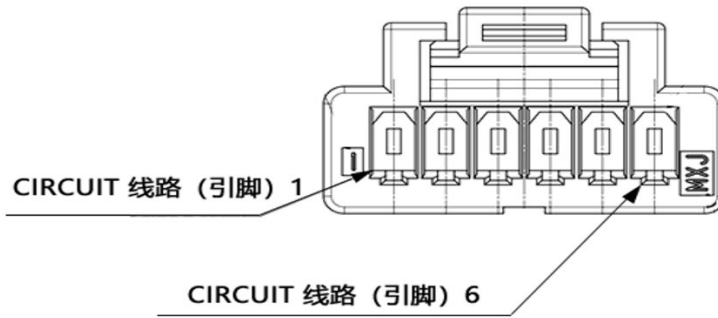


图1 Stitch indication

表2. Stitch definition diagram

Serial number	Definition	Explain	Signal type	Cable color
1	+5V	5V power supply		Red
2	GND	Power ground		Black
3	USART_TX	Serial port sending		Ash
4	USART_RX	Serial port receiving		Brown
5	SYNC	Synchronous control signal input	3.3 V TTL level	Blue
6	MCLR#	Emulator Reserved		White

6. Fabric interface

The BS-IU64-M-D6EC measures 22.4mm X 22.4mm X 10.54mm and weighs 20g ± 2g.

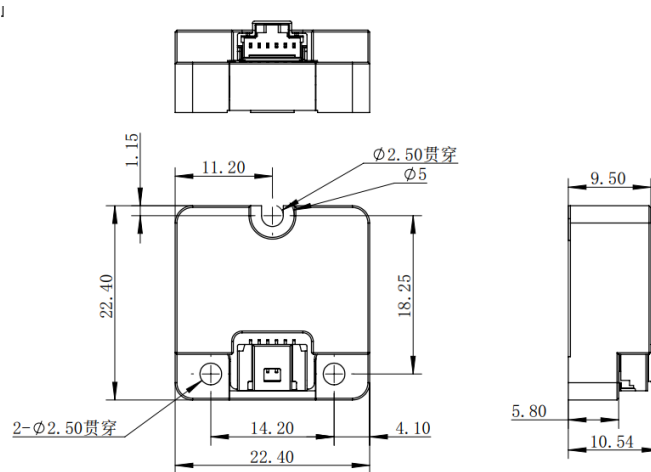


图2 Schematic diagram of structure outline

7. Instructions for use

7.1. Coordinate system definition

3 gyros ($g_x \square g_y \square g_z$) and 3 accelerometers ($a_x \square a_y \square a_z$) is defined as shown in the figure below, and the direction of the arrow is positive.

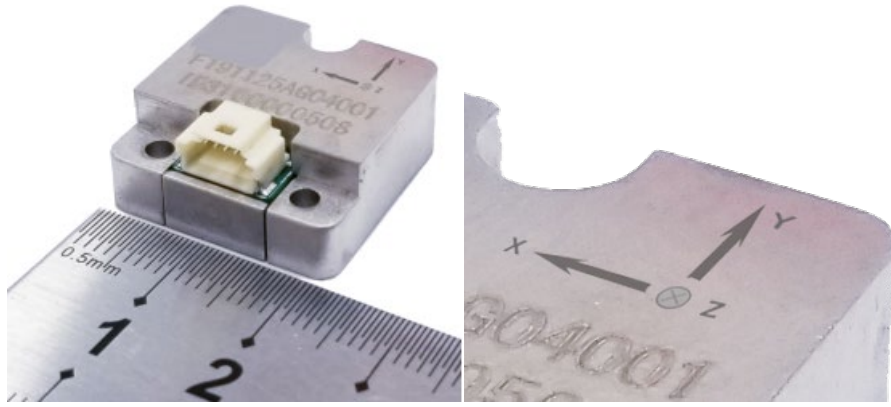


图3 Appearance and coordinate diagram

7.2. UART reads and writes data

7.2.1. Interface

Default configuration: 115200bps, 8 data bits, 1stop bit, no parity;

7.2.2. Protocol format

It is divided into protocol head, protocol body and protocol tail; 200 Hz; the coordinate axis is defined as front upper right

表3. Serial port protocol table

Offset	Definition	Format	Length	Coefficient	Unit	Explain
0	0xBD		1			
1	0xDB		1			
2	0x0A		1			
3	Gyro x-axis	FLOAT	4	(LSB_first)	deg/s	
7	Gyro y-axis	FLOAT	4	(LSB_first)	deg/s	
11	Gyro z-axis	FLOAT	4	(LSB_first)	deg/s	
15	Add x-axis of the table	FLOAT	4	(LSB_first)	m/s ²	
19	Add the y-axis of the table	FLOAT	4	(LSB_first)	m/s ²	
23	Add z-axis of the table	FLOAT	4	(LSB_first)	m/s ²	
27	Temperature	INT16	2	(LSB_first)	°C	200.0/32768.0
29	Reserved	U16	2			
31	Frame count	U16	2	(LSB_first)		
33	Check digit	U8	-	-	-	Xor check, including data from 0 to 32

● U8 is

● U16

Explain a 1-byte unsigned integer; is a 2-byte unsigned integer, with the low byte preceding

and the high byte following;

- INT16 is a 2-byte signed integer, with the low byte preceding and the high byte following;
- U32 is a 4-byte unsigned integer, with the low byte preceding and the high byte following;
- FLOAT is a single-precision signed floating-point type, with the low byte preceding and the high byte following;