				Format
Diskette			Farewe	
2 isheece			ll Phases	S
			Mark	
CAD				
	DC IC			
	B2-1C	24HA-M-D6EC		
	High progision	version of inertial measurement unit		
	Tright-precision	version of mertial measurement unit		
	F	R2.900.002SM		
Countersig				
Countersig				
	Compilation	Li Yilong is 20200903		
	0 0 			
	D 6 1	Lin Vin is 20200002		
	Proofread	Liu Xin is 20200903		
	Audit	Zhang Jie is 20200903		
	Bid review			
	Approval	He Jia is 20200903		
Description	¹ sppi ovai			
Description				
Trace and				
Old base map				
Old buse map				
Base map				
· · · · ·				
			Page	1 of 13

Diskette		This ins	truction manu	al is the	main docı	ument for	the operation	of the			
CA		BS-IC24HA-	-M-D6EC iner	tial meas	surement ı	unit.					
		This ins	struction man	ual is ma	ainly com	piled in	accordance wi	th the			
		Technical Sp	pecifications t	for Inerti	ial Measu	rement U	Unit and Thre	e-axis			
		Gyroscope U	nit.								
		1. Product fu	nctions and re	elevant te	chnical pa	arameters					
		1. Product functions and relevant technical parameters									
		1.1 Composition and function									
		The	BS-IC24HA-1	M-D6EC	inertial	measu	rement unit	is a			
		complete in	ertial system	with a bu	ilt-in thre	e-axis gy	roscope and a	three-			
		axis accelero	ometer, which	is use	d to mea	asure the	three-axis a	ngular			
		rate, acceler	ation and oth	er para	meters o	of the o	carrier, and	output			
		the data	after erro	r compe	ensation	(inclu	ding tempo	erature			
		compensation	n, installati	on misali	gnment a	ngle com	pensation, nor	nlinear			
		compensation	n, etc.) throug	gh SPI ac	cording to	the com	munication pro	otocol.			
		1.2 Main tecl	hnical parame	ters							
			1								
			T	表 1 Te	chnical paran Minimu	neters					
		Parameter	Test condi	Test conditions		Typical	value Maximu m value	Unit			
		Dynamic measuring range				±450	0	°/S			
		Bias instability	Allan variance, b	etter than		0.3		°/h			
		Bias stability	1s smooth, RMS than	, better		10		°/h			
		Bias in full temperature range	-40 °C ~ 85 °C, 1 smoothing, RMS			0.00	5	°/s			
	Gyro	Random walk	16			0.15	3	°/√h			
		Bias repeatability	16			10		°/h			
\ '\ፖለ-ሂ፤ ለ		Output noise Scale factor	No filtering, RM	.S		0.05)	°/s			
MX AUC).		repeatability	16			0.01		%			
Trace and		Scale factor nonlinearity	16			0.01		%			
Old base map		Scale factor	FS=450 °/s, 32bi	ts		26214	40	LSB/°/sec			
Oid base map											
Base map				BS-IC	24HA-M-	D6EC	R2.900.00)5SM			
	Mark	Change order	Signature,	Pag	ge of 13 No.2	Page					
				•							

Diskette		Parameter	Test condi	tions	Minimu m value	Typical v	alue Maximu m value	Unit	
CA		Bandwidth (-3dB)			III varue	250	iii vaide	Hz	
		Cross coupling				0.1		%	
		Acceleration				0.1			
		sensitivity				1		°/h/g	
		Vibration rectification effect				0.5		°/h/g2	
		Resonant frequency				12k		Hz	
		Dynamic measuring range				±20		g	
		Bias stability	Allan variance			2		ug	
		Bias in full temperature range	-40 °C ~ 85 °C, 1 smoothing, RMS			1		mg	
	l l .	Random walk	16 16 No filtering, RMS			0.029)	m/s/√h	
	Acce	Bias repeatability				5		mg	
	lero	Output noise				0.5		mg	
	mete r	Scale factor repeatability	16	16		0.1		%	
		Scale factor nonlinearity	FS=20g		0.1		%FS		
		Scale factor	±20, 32bits			655360	00	g/LSB	
		Bandwidth (-3dB)	,			250		Hz	
		Cross coupling				0.1		%	
	Tem perat					0.012	5	°C/LSB	
	Com muni catio n inter	1-way SPI	Enter the clock fr			8	15	MHz	
	Elect	Voltage	Direct current			3.3 ± 10)%	V	
\ I\\-\\\\\	rical	Power				1	1.5	W	
	char acter	1							
Trace and	istics	Ripple	P-P			48±2		mV	
	Use	Operating	Scalable		-40		85	°C	
ld base map	<u> </u>		<u> </u>			Ī			
Base map	BS-		BS-IO	IC24HA-M-D6EC		R2.900.005	5SM		
	Mark	Change order	Signature,	Pag	ge of 13 No.3	Page			

Diskette							
]	Parameter	Test conditions	Minimu m value	Typical value	Maximu m value	Unit
CA	envir	temperature					
	onm	Storage		-55		85	°C
	ent	temperature		-33		0.5	C
		Vibration			10~2000Hz, 6.06g		
		Impact			1000g, 0.1ms		

2 Structural features and electrical connections

The outline drawing of the BS-IC24HA-M-D6EC IMU is shown in Figure 1.

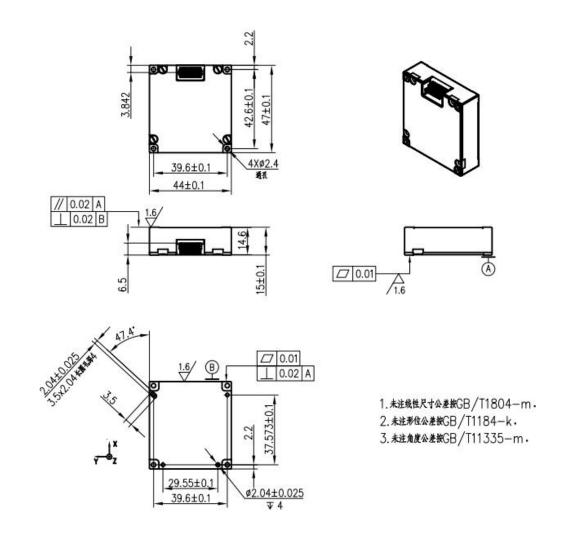


Figure 1 Outline drawing

The model of the connector connecting the product to the outside is FTMH-112-02-H-DH. See Table 2 for the definition of the contact. The corresponding connector model is CLM-112-02-GDA.

The connector is as shown in the figure.

Old	base	man
Oiu	vasc	шар

Trace and

 $\sqrt{7}$ $\sqrt{4}$ $\sqrt{1}$

Base	map					BS-IC24HA-M-D6EC	R2.900.005SM
		Mark	Change	order	Signature,	Page of 13 No.4Page	

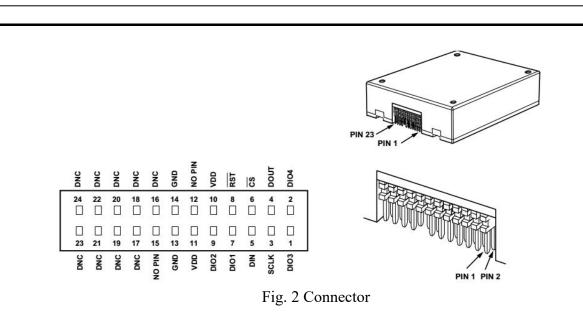


表 2 Definition of contact

Pin sequence number	Name	Туре	Description
10, 11	VDD	Power source	
13, 14	GND	Power source	
7	DIO1	Input/output	
9	DIO2	Input/output	C1
1	DIO3	Input/output	General purpose IO, configurable
2	DIO4	Input/output	
3	SPI-CLK	Input/output	
4	SPI-MISO	Input/output	CDI -1 1-
5	SPI-MOSI	Input/output	SPI slave mode
6	SPI-/CS	Input/output	
Other	NC	Spare	Retained by the manufacturer

The product axial direction is shown in Figure 3.

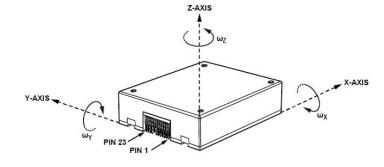


Figure 3 Product Sensitive Axial

Old	base	map
Ola	base	map

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Base maj	,				BS-IC24HA-M-D6EC	R2.900.005SM
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Diskette		3 Comm	unication i	nterface							
CA	_	Comm									
		3.1 SPI com	munication								
		The communication of IMU adopts 4-wire SPI standard interface.									
		The maxim	um internal da	ta refresh fred	mency of th	ne product is	2 4KH2				
		The maximum internal data refresh frequency of the product is 2.4KHz,									
		and the max	imum commur	nication SPI ra	te is 15Mbp	S.					
		3.1.2 Timing specification									
		$TC = 25 \circ C$	V, $VDD = 3.3 V$, unless otherw	vise noted.						
	表 3 Timing specification										
		Parameter	Explain	N	Jormal mode	e	Unit				
				Minimum	Typical	Maximum					
				value	value	value					
		fSCLK	Serial clock	0.01		15	MHz				
		tSTALL	Stall period between data	2			μs				
		tCLS	Serial Clock	31			ns				
		+CHC	Low Period Serial Clock	21							
		tCHS	High Period	31			ns				
		tCS	Chip Select to	32			ns				
		tDAV	Clock Ed DOUT valid			10	ns				
		(DCI)	after SCLK ed								
		tDSU	DIN setup time before SCLK rising ed	2			ns				
X IY-VXV/	1	tDHD	DIN hold time after SCLK	2			ns				
Trace and		tDR, tDF	rising ed DOUT Rise/Fall		3	8	ns				
Old base	-		Time, _ Load								
Old base map						<u> </u>					
				BS-IC24HA-M-D6EC R2.900.005SN			005SM				
Base map				B5 102 1111	I WI DOLC	K2.900	.003SWI				

Diskette										
	-		10	00 pF						
		tDSOI		S Asserted	to	0			11	ns
CA			D	ata Ou	tput					
			V	alid						
		tHD	S	CLK edge	to	0				ns
			da	ata ou	tput					
			in	valid						
		tSFS	La	ast SCLK 6	edge	32				ns
			to	CS deasser	ted					
		tDSHI	[0 C	S deasserte	d to	0			9	ns
			da	ata output l	high					
			in	npedance						
			cs \			<u> </u>				<u></u>
			\	_		CHS →	→ t _{CLS}	H	-1	1.
				1 / 2	3	\ 4 \ \ 5 \ \	- 6			 − t _{SFS}
			SCLK -	-t _{DSOE} →	✓ t _{DAV}		L HD	$\ - \ $		→ t _{DSHI}
			DOUT -	мѕв	DB14 DB1	3 DB12 DE	311 DB10		DB2 DB1 LS	_
			`		t _{DSU}	→ t _{DHD}				
			DIN //////	R/W	A6 A5	A4 X A3	A2 X	\mathcal{X}	D2 D1 LS	sв X ///X
			Figure 4 Timi	na Diagra			<u> </u>	7—		
			riguic 4 Tillii	iig Diagra l _	111				. 1	
			-			t _{STAI}				_
			cs							
			Figure 5. Stall	Time and	l Data Rat					
		3.1.3	Figure 5. Stall B Data Re	egister .	Address	Mapping				
		3.1.3	Figure 5. Stall B Data Re	egister .	Address memory	map data i	s defined			
		3.1.3	Figure 5. Stall B Data Re The user r	egister .	Address memory 表 4	map data i	s defined		lata	
		3.1.3	Figure 5. Stall B Data Re	egister .	Address memory 表 4 PAGE_I	map data i	s defined			iption
		3.1.3	Figure 5. Stall B Data Re The user r	egister .	Address memory 表 4	map data i	s defined		lata	
		3.1.3	Figure 5. Stall B Data Re The user r	egister :	Address memory 表 4 PAGE_I D	map data i User regist Address	s defined er memory i Default		lata Register descri	tion
		3.1.3	Figure 5. Stall B Data Re The user r Name PAGE_ID	egister :	Address memory 表 4 PAGE_I D 0x00	map data i User regist Address	s defined er memory posterior Default	тар с	Register descri	tion
₩ ₩		3.1.3	Figure 5. Stall B Data Re The user r Name PAGE_ID TEMP_OUT	egister Aregister R/W	Address memory 表 4 PAGE_I D 0x00 0x00	map data i User regist Address 0x00 0x0E	s defined er memory i Default 0x00 N/A	map c	Register descri Page identifica Temperature	tion e ut, low word
ሻ ፤ሧ - ኒለ ጚ /		3.1.3 x. x.	Figure 5. Stall B Data Re The user r Name PAGE_ID TEMP_OUT GYRO_LOW	egister R/W R/W R	Address memory 表 4 PAGE_I D 0x00 0x00 0x00	User regist Address 0x00 0x0E 0x10,0x11	s defined er memory process defined er memor	X-a	Page identifica Temperature	tion e ut, low word tt, high word
		3.1.3	Figure 5. Stall B Data Re The user r Name PAGE_ID TEMP_OUT GYRO_LOW GYRO_OUT	egister Aregister R/W R/W R R	### Address ### Market Address ### ### ### ### ### ### ### ### #### ####	map data i User regist Address 0x00 0x0E 0x10,0x11 0x12,0x13	s defined er memory i Default 0x00 N/A N/A N/A	X-ax Y-ax	Page identifica Temperature xis gyroscope output	tion e ut, low word tt, high word ut, low word
		3.1.3	Figure 5. Stall B Data Re The user r Name PAGE_ID TEMP_OUT GYRO_LOW GYRO_OUT GYRO_LOW GYRO_OUT	egister 2 R/W R/W R R R	Address memory 表 4 PAGE_I D 0x00 0x00 0x00 0x00 0x00	map data i User regist Address 0x00 0x0E 0x10,0x11 0x12,0x13 0x14,0x15	s defined er memory i Default 0x00 N/A N/A N/A N/A	X-ax X-ax Y-ax	Page identifica Temperature xis gyroscope output	tion e ut, low word ut, high word ut, low word ut, high word
		3.1.3	Figure 5. Stall B Data Re The user r Name PAGE_ID TEMP_OUT GYRO_LOW GYRO_OUT GYRO_LOW GYRO_OUT GYRO_LOW GYRO_LOW	egister A	### Address ### Manage	map data i User regist Address 0x00 0x0E 0x10,0x11 0x12,0x13 0x14,0x15 0x16,0x17	s defined er memory i Default 0x00 N/A N/A N/A N/A N/A	X-ax X-ax Y-ax Y-ax Z-ax	Page identifica Temperature xis gyroscope output	ttion e ut, low word ut, high word ut, low word ut, high word ut, high word ut, high word ut, high word
Trace and		3.1.3	Figure 5. Stall B Data Re The user r Name PAGE_ID TEMP_OUT GYRO_LOW GYRO_OUT GYRO_LOW GYRO_OUT	egister : R/W R/W R R R R	### Address ### Manage	map data i User regist Address 0x00 0x0E 0x10,0x11 0x12,0x13 0x14,0x15 0x16,0x17 0x18,0x19	s defined er memory i Default 0x00 N/A N/A N/A N/A N/A N/A	X-ax X-ax Y-ax Y-ax Z-ax	Page identifica Temperature xis gyroscope output	ttion e ut, low word ut, high word ut, low word ut, high word ut, high word ut, high word ut, high word
አ ዝሂ-ኒልፒ⁄ Trace and		3.1.3	Figure 5. Stall B Data Re The user r Name PAGE_ID TEMP_OUT GYRO_LOW GYRO_OUT GYRO_LOW GYRO_OUT GYRO_LOW GYRO_LOW	egister : R/W R/W R R R R	### Address ### Manage	map data i User regist Address 0x00 0x0E 0x10,0x11 0x12,0x13 0x14,0x15 0x16,0x17 0x18,0x19	s defined er memory i Default 0x00 N/A N/A N/A N/A N/A N/A	X-ax X-ax Y-ax Y-ax Z-ax	Page identifica Temperature xis gyroscope output	ttion e ut, low word ut, high word ut, low word ut, high word ut, high word ut, high word ut, high word
Trace and		3.1.3	Figure 5. Stall B Data Re The user r Name PAGE_ID TEMP_OUT GYRO_LOW GYRO_OUT GYRO_LOW GYRO_OUT GYRO_LOW GYRO_LOW	egister : R/W R/W R R R R	### Address ### Manage	map data i User regist Address 0x00 0x0E 0x10,0x11 0x12,0x13 0x14,0x15 0x16,0x17 0x18,0x19 0x1A,0x1B	s defined er memory i Default 0x00 N/A N/A N/A N/A N/A N/A N/A N	X-ax X-ax Y-ax Z-ax Z-ax	Page identifica Temperature xis gyroscope output	ttion e ut, low word ut, high word ut, low word ut, high word
Trace and		3.1.3	Figure 5. Stall B Data Re The user r Name PAGE_ID TEMP_OUT GYRO_LOW GYRO_OUT GYRO_LOW GYRO_OUT GYRO_LOW GYRO_LOW	egister : R/W R/W R R R R	### Address ### Manage	map data i User regist Address 0x00 0x0E 0x10,0x11 0x12,0x13 0x14,0x15 0x16,0x17 0x18,0x19	s defined er memory i Default 0x00 N/A N/A N/A N/A N/A N/A N/A N	X-ax X-ax Y-ax Z-ax Z-ax	Page identifica Temperature xis gyroscope output	ttion e ut, low word ut, high word ut, low word ut, high word ut, low word ut, high word ut, high word ut, high word
Trace and base map		3.1.3	Figure 5. Stall B Data Re The user r Name PAGE_ID TEMP_OUT GYRO_LOW GYRO_OUT GYRO_LOW GYRO_OUT GYRO_LOW GYRO_LOW	egister : R/W R/W R R R R	### Address ### Manage	map data i User regist Address 0x00 0x0E 0x10,0x11 0x12,0x13 0x14,0x15 0x16,0x17 0x18,0x19 0x1A,0x1B	s defined er memory i Default 0x00 N/A N/A N/A N/A N/A N/A N/A N	X-ax X-ax Y-ax Z-ax Z-ax	Page identifica Temperature xis gyroscope output	tion e ut, low word ut, high word ut, low word ut, high word ut, low word ut, high word ut, high word ut, high word

X_ACCL_LOW	R	0x00	0x1C,0x1D	N/A	X-axis accelerometer output, low
					word
X_ACCL_OUT	R	0x00	0x1E,0x1F	N/A	X-axis accelerometer output, high
					word
Y_ACCL_LOW	R	0x00	0x20,0x21	N/A	Y-axis accelerometer output, low
					word
Y_ACCL_OUT	R	0x00	0x22,0x23	N/A	Y-axis accelerometer output, high
					word
Z_ACCL_LOW	R	0x00	0x24,0x25	N/A	Z-axis accelerometer output, low
					word
Z_ACCL_OUT	R	0x00	0x26,0x27	N/A	Z-axis accelerometer output, high
					word

3.1.4 SPI communication and configuration

Read the sensor data

A single register read requires two 16-bit SPI cycles. In the first cycle, a read of the contents of a register is requested using the bit assignment function in Figure 6; in the second cycle, the register contents are output on DOUT. The first bit of the DIN command is 0, followed by the high or low address of the register. The last eight bits are don't care, but the SPI requires the full 16 SCLKs to receive the request. Figure 5 shows two consecutive register reads, starting with DIN = 0x1A00, requesting the contents of the Z GYRO OUT register, followed by DIN = 0x1800, requesting the contents of the Z GYRO LOW register.

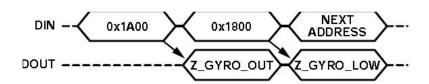


Figure 6. SPI Read Example

4 SPI Data Register

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After the BS-IC24HA-M-D6EC starts the process, the PAGE _ ID register value is 0 x0000, which sets Page 0 as the valid page for SPI access. Page 0

Old base map						
Base map					BS-IC24HA-M-D6EC	R2.900.005SM
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Diskette	contains the output data product identification registers							
	contains the output data, product identification registers.							
CA	4.1 Inertial Sensor Data Format							
	The output data registers for the gyroscopes and accelerometers use a							
	32-bit, twos complement format. Two registers per output are used to							
	support this resolution. Figure 7 illustrates the role of each register in various inertial measurements by way of example. In this example, the X _							
	GYRO $_$ OUT is the most significant word (upper 16 bits) and the X $_$							
	GYRO _ LOW is the least significant word (lower 16 bits). In many cases,							
	using only the most significant word register provides enough resolution							
	to reflect the key performance metrics.							
	X_GYRO_OUT X_GYRO_LOW							
	15 0 15 0							
	X-AXIS GYROSCOPE DATA							
	Figure 7. Gyro Data Output Example							
	Tigure 7. Gyro Bata Gatput Example							
	4.1.1 Gyroscope							
	The main registers used for gyroscope measurements use the X _ GYRO _ OUT format (see Table 5, Table 6, and Table 7). The 16-bit twos complement data format is used when processing data from these registers. Table 8 show an example of that digital encoding of the X _ GYRO _ OUT.							
	表 5 X_GYRO_OUT (Page 0, Base Address = $0x12$)							
	表 5 X_GYRO_OUT (Page 0, Base Address = 0x12) Bit Explain							
	Bit Explain [15:0] X-axis gyroscope data; twos complement, ± 450 °/sec range, 0 °/sec =							
ሻ ተሧ - \አ ር ⁄	Bit Explain [15:0] X-axis gyroscope data; twos complement, ± 450 °/sec range, 0 °/sec = 0x0000, 1 LSB = 0.025 °/sec							
ሻ ፤ ሧ-ኒ ል ር ⁄⁄	Bit Explain [15:0] X-axis gyroscope data; twos complement, ± 450 °/sec range, 0 °/sec =							
	Bit Explain [15:0] X-axis gyroscope data; twos complement, ± 450 °/sec range, 0 °/sec = 0x0000, 1 LSB = 0.025 °/sec 表 6 Y_GYRO_OUT (Page 0, Base Address = 0x16)							
Trace and	Bit Explain [15:0] X-axis gyroscope data; twos complement, ± 450 °/sec range, 0 °/sec = 0x0000, 1 LSB = 0.025 °/sec 表 6 Y_GYRO_OUT (Page 0, Base Address = 0x16)							
Trace and	Bit Explain [15:0] X-axis gyroscope data; twos complement, ± 450 °/sec range, 0 °/sec = 0x0000, 1 LSB = 0.025 °/sec 表 6 Y_GYRO_OUT (Page 0, Base Address = 0x16)							

Page of 13 No.9Page

Mark

Change

Signature,

order

iskette	1		[15:0]			pe data; twos compl = 0.025 °/sec	ement, ± 4	50 °/sec range, 0 °/sec =
CA	1						- (-)	
	1					Z_GYRO_OU	I' (Page 0, I	Base Address = $0x1A$)
			Bit	Ex	plain			
			[15:0]			pe data; twos compl = 0.025 °/sec	ement, ± 45	50 °/sec range, 0 °/sec =
					表 8	Example of X _ C	GYRO_OU	UT data format
			Rotation ra	ate	Decimal system	Hexadecimal	Binary	
			+450°/sec		+18,000	0x4650	0100 01	10 0101 0000
			+0.05/sec		+2	0x0002	0000 000	00 0000 0010
			+0.025°/se	ec	+1	0x0001	0000 000	00 0000 0001
			0°/sec		0	0x0000	0000 000	00 0000 0000
			-0.025°/se	ec	-1	0xFFFF	1111 11	11 1111 1111
			-0.05°/sec	:	-2	0xFFFE	1111 11	11 1111 1110
			-450°/sec		-18,000	0xB9B0	1011 10	01 1011 0000
		10, a	nd Table	11). The	e MSB ha	s a weight of 0 revious bit.	.0125 °/	(see Table 9, Table sec, and subsequen
		10, a	nd Table	11). The	e MSB ha ⁄2 of the pi 表 9	s a weight of 0 revious bit.	.0125 °/	`
		10, a	nd Table	11). The eight of 1	e MSB ha ② of the pi 表 9	s a weight of 0 revious bit.	.0125 °/ W (Page 0,	sec, and subsequen Base Address = 0x10)
		10, a	and Table have a we	11). The eight of 1	e MSB ha 2 of the pr 表 9 Eplain axis gyrosco	s a weight of 0 revious bit. X_GYRO_LO pe data; additional r	.0125 °/ W (Page 0,	sec, and subsequen Base Address = 0x10)
		10, a	and Table have a we	11). The eight of 1	e MSB ha 2 of the pr 表 9 Eplain axis gyrosco	s a weight of 0 revious bit. X_GYRO_LO pe data; additional r	.0125 °/ W (Page 0,	sec, and subsequen Base Address = 0x10)
		10, a	and Table have a we Bit [15:0]	11). The eight of 1/2	e MSB ha 2 of the pr 表 9 Eplain axis gyrosco 表 10	s a weight of 0 revious bit. X_GYRO_LO pe data; additional r	.0125 °/ W (Page 0, esolution b W (Page 0,	sec, and subsequen Base Address = $0x10$) it Base Address = $0x14$)
		10, a	Bit [15:0] Bit [15:0]	11). The eight of ½	e MSB ha 2 of the pr 表 9 Eplain axis gyrosco 表 10 Eplain axis gyrosco 表 11	s a weight of 0 revious bit. X_GYRO_LO pe data; additional r O Y_GYRO_LO pe data; additional r	W (Page 0, esolution by W (Page 0,	sec, and subsequen Base Address = $0x10$) it Base Address = $0x14$)
		10, a	Bit [15:0] Bit [15:0]	11). The eight of ½ Ex X-	表 9 Eplain axis gyrosco 表 10 Eplain axis gyrosco 表 11 Eplain	s a weight of 0 revious bit. X_GYRO_LO pe data; additional r O Y_GYRO_LO pe data; additional r	W (Page 0, esolution by W (Page 0, esolution by W (Page 0,	sec, and subsequent Base Address = $0x10$) it Base Address = $0x14$) it Base Address = $0x14$)
<u>Ι</u> Ψ- ν λ Γ ν		10, a	Bit [15:0] Bit [15:0]	11). The eight of ½ Ex X-	表 9 Eplain axis gyrosco 表 10 Eplain axis gyrosco 表 11 Eplain	s a weight of 0 revious bit. X_GYRO_LO pe data; additional r O Y_GYRO_LO pe data; additional r	W (Page 0, esolution by W (Page 0, esolution by W (Page 0,	sec, and subsequent Base Address = $0x10$) it Base Address = $0x14$) it Base Address = $0x14$)
Ψ-ν λ ι Γγ		10, a	Bit [15:0] Bit [15:0]	11). The eight of ½ Ex X-	表 9 Eplain axis gyrosco 表 10 Eplain axis gyrosco 表 11 Eplain	s a weight of 0 revious bit. X_GYRO_LO pe data; additional r O Y_GYRO_LO pe data; additional r	W (Page 0, esolution by W (Page 0, esolution by W (Page 0,	sec, and subsequent Base Address = $0x10$) it Base Address = $0x14$) it Base Address = $0x14$)
		10, a	Bit [15:0] Bit [15:0]	11). The eight of ½ Ex X-	表 9 Eplain axis gyrosco 表 10 Eplain axis gyrosco 表 11 Eplain	s a weight of 0 revious bit. X_GYRO_LO pe data; additional r O Y_GYRO_LO pe data; additional r	W (Page 0, esolution by W (Page 0, esolution by W (Page 0,	sec, and subsequent Base Address = $0x10$) it Base Address = $0x14$) it Base Address = $0x14$)
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Trace and base map		10, a	Bit [15:0] Bit [15:0]	11). The eight of ½ Ex X-	e MSB ha 2 of the pr 表 9 Eplain axis gyrosco 表 11 Eplain axis gyrosco 表 11 Eplain axis gyrosco	s a weight of 0 revious bit. X_GYRO_LO pe data; additional r O Y_GYRO_LO pe data; additional r	W (Page 0, esolution by W (Page 0, esolution by W (Page 0, esolution by Page 0, esolution bit)	sec, and subsequent Base Address = $0x10$) it Base Address = $0x14$) it Base Address = $0x14$)
Trace and base map		10, a	Bit [15:0] Bit [15:0]	11). The eight of ½ Ex X-	e MSB ha 2 of the pr 表 9 Eplain axis gyrosco 表 11 Eplain axis gyrosco 表 11 Eplain axis gyrosco	s a weight of 0 revious bit. X_GYRO_LO pe data; additional r O Y_GYRO_LO pe data; additional r I Z_GYRO_LO pe data; additional re	W (Page 0, esolution by W (Page 0, esolution by W (Page 0, esolution by Page 0, esolution bit)	sec, and subsequent Base Address = $0x10$) it Base Address = $0x14$) it Base Address = $0x18$)

Diskette		417	Acceler	ometer								
CA		7,1,2	Acceler	ometer								
			The mai	n regis	sters for	accelerometer	measurer	nents use the X				
		ACCI OUT format (see Table 12 Table 13 and Table 14) The 16 bit										
		ACCL OUT format (see Table 12, Table 13, and Table 14). The 16-bit										
		twos	comple	nent da	ata form	at is used when	processi	ng data from these				
		regis	iters Tah	de 15	shows	an example of	X AC	CL _ OUT digital				
		regis	icis. Tac	71C 13	SHOWS	an example of		CL _ OUT digital				
		enco	ding.									
					表	₹ 12 X_ACCL_OU	T (Page 0, 1	Base Address = $0 \times 1E$)				
			Bit	Expla	ain							
			[15:0]	X-axis	s accelerome	ter data; twos complement	, ± 20 G rang	e, 0 G = 0x0000, 1 LSB = 1				
				mg		= 10 M + 007 - 07	T (D) -	2 411 2 22				
			Die	Tr. 1		₹ 13 Y_ACCL_OU	T (Page 0, I	Base Address = $0x22$)				
			Bit [15:0]	Expla		tor data: two accomplant	± 20 C =====	e, 0 G = 0x0000, 1 LSB = 1				
			[15:0]	mg	s accelerome	ter data; twos comptement	, ± 20 G rang	e, 0 G = 0x0000, 1 LSB = 1				
					表	₹ 14 Z_ACCL_OU	T (Page 0, I	Base Address = $0x26$)				
			Bit	Expla				· · · · · ·				
			[15:0]	Z-axis	accelerome	ter data; twos complement	, ± 20 G rang	e, 0 G = 0x0000, 1 LSB = 1				
				mg								
					表 Decimal	₹ 15 Example of X		JT data format				
			Acceler	Acceleration		Hexadecimal	Binary					
			+20g		+20,000	0x4E20	E20 0100 11	10 0010 0000				
			+2mg		+2	0x0002		00 0000 0010				
		+1mg			+1	0x0001	0000 0000 0000 0001					
			0 mg		$\begin{vmatrix} 0 \\ -1 \end{vmatrix}$	0x0000 0xFFFF		1 1111 1111				
			-1mg -2mg		$\begin{bmatrix} -1 \\ -2 \end{bmatrix}$	0xFFFE		1 1111 1110				
			-20g		-20,000			01 1110 0000				
			Registers	using	the X	ACCL LOW	naming	format are used to				
\ \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	1					_						
		impr	ove the r	esolution	on of the	e accelerometer i	neasuren	nents (see Table 16,				
Trace and		Tabl	e 17, and	Table 1	18). The	MSB has a weig	ht of 0.5	mg, and subsequent				
					·			-				
Old base map												
Base map						BS-IC24HA-M-I	D6EC	R2.900.005SM				
						Dece -£1231 11	Daga					
	Mark	Change	order	Signatu	re,	Page of 13 No.11	rage					

	_	hita	howa o w	aight a	of 1/2 of th	a pravious hit					
CA	1	UIIS	nave a w	eigiii o		e previous bit.	OW (Do co 0	Dogs Address = 0 V 1C)			
	1		Bit	Eve		₹ 16 X_ACCL_L	Ow (Page 0,	Base Address = 0 X 1C)			
			[15:0]		olain 	meter data; additional	resolution b	it			
			[13.0]	71 0		·					
			D'4	Г		麦 17 Y_ACCL_LC	OW (Page 0,	Base Address = 0×20)			
			Bit	Bit Explain [15:0] X-axis accelerometer data; additional resolution bit							
			Bit	表 18 Z_ACCL_LOW (Page 0, Base Address = 0x24)							
			[15:0]		olain	meter data; additional	resolution b	it			
			[13.0]	X-a	ixis accelero	meter data, additional	Tesolution 6	11			
		414	5 Interna	ıl temr	perature						
								nternal temperature			
		mea	surement	that o	can be u	sed to observe	relative t	temperature changes			
		within the product (see Table 19). Table 20 shows an example of TEMP									
		with	in the pro	oduct ((see Table	e 19). Table 20 s	shows an	example of TEMP			
			_					_			
			_					example of TEMP _ is higher than the			
		OU".	Γ digital	encod	ding. No		nperature	_			
		OU".	Γ digital	encod	ding. No	te that this ten	nperature ets.	_			
		OU".	Γ digital	encoc	ding. No	te that this ten	nperature ets.	is higher than the			
		OU".	Γ digital	encoc perature	ding. No e due to s \bar{z} Explain Temperature	te that this tenself-heating effects 19 TEMP_OUT	nperature ets. (Page 0, Bas	is higher than the			
		OU".	Γ digital ient temp	encoc perature	ding. No e due to s Explain Temperature	te that this tenself-heating effects 19 TEMP_OUT (data; twos complem	rperature ets. (Page 0, Base ent, 0.0125	is higher than the e Address = 0x0E) Bit ° C/LSB, 25 ° C = 0 X			
		OU".	Γ digital ient temp Bit [15:0]	encoc perature	ding. No e due to s Explain Temperature	te that this tenself-heating effects 19 TEMP_OUT (data; twos complem 20 Example of TE	rperature ets. (Page 0, Base) ent, 0.0125	is higher than the e Address = 0x0E) Bit ° C/LSB, 25 ° C = 0 X			
		OU".	Γ digital ient temp	encoc perature	ding. No e due to s Explain Temperature 0000 Decin	te that this tenself-heating effects 19 TEMP_OUT data; twos complem 20 Example of TE Hexadecimal	rperature ets. (Page 0, Base ent, 0.0125	is higher than the e Address = 0x0E) Bit ° C/LSB, 25 ° C = 0 X			
		OU".	Γ digital ient temp Bit [15:0]	encoc perature	ding. No e due to s Explain Temperature	te that this tenself-heating effects E 19 TEMP_OUT (data; twos complements) E 20 Example of TE Hexadecimal	ent, 0.0125 MP_OUT or Binary	is higher than the e Address = 0x0E) Bit ° C/LSB, 25 ° C = 0 X			
		OU".	Gigital ient temp Bit [15:0] Temperate +85 +25+0.0	encoc perature I	ding. No e due to s Explain Temperature 0000 Decin syster +4800 +2	te that this tenself-heating effects E 19 TEMP_OUT (data; twos complements E 20 Example of TE Mal Hexadecimal 0 0x12C0 0x0002	mperature ets. (Page 0, Base) ent, 0.0125 MP _ OUT o	is higher than the e Address = 0x0E) Bit ° C/LSB, 25 ° C = 0 X data format 10 1100 0000 00 0000 0010			
√ √√√	-	OU".	Bit [15:0] Temperate +85 +25 + 0.0 +25 + 0.0	encoc perature I	ding. No e due to s Explain Temperature 0000 Decin syster +4800 +2 +1	te that this tenself-heating effects E 19 TEMP_OUT (data; twos complements E 20 Example of TE mal Hexadecimal m 0x12C0 0x0002 0x0001	Page 0, Base ent, 0.0125 MP _ OUT 0 Binary 0001 00 0000 00 0000 00	is higher than the e Address = 0x0E) Bit ° C/LSB, 25 ° C = 0 X data format 10 1100 0000 00 0000 0010 00 0000 000			
ij Ϋ- ΛΨΔΛ		OU".	Gigital ient temp Bit [15:0] Temperate +85 +25+0.0	encoc perature I ure	ding. No e due to s Explain Temperature 0000 Decin syster +4800 +2	te that this tenself-heating effects E 19 TEMP_OUT (data; twos complements E 20 Example of TE Mal Hexadecimal 0 0x12C0 0x0002	mperature ets. (Page 0, Base ent, 0.0125 MP _ OUT o Binary 0001 00 0000 00 0000 00 0000 00	is higher than the e Address = 0x0E) Bit ° C/LSB, 25 ° C = 0 X data format 10 1100 0000 00 0000 0010			
		OU".	Bit [15:0] Temperate +85 +25 + 0.0 +25 + 0.0 +25	encoc perature 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Decin system +4800 +2 +1 0	te that this tenself-heating effects E 19 TEMP_OUT (data; twos complements E 20 Example of TE Mal Hexadecimal O 0x12C0 0x0002 0x0001 0x0000	mperature ets. (Page 0, Baselent, 0.0125 MP _ OUT of Binary 0001 00 0000 00 0000 00 0000 00 0000 00	is higher than the e Address = 0x0E) Bit ° C/LSB, 25 ° C = 0 X data format 10 1100 0000 00 0000 0010 00 0000 000			
		OU".	Bit [15:0] Temperate +85 +25 + 0.0 +25 +25 - 0.0	encoc perature 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Decine	te that this tenself-heating effects E 19 TEMP_OUT (data; twos complements E 20 Example of TE Mal Hexadecimal O 0x12C0 0x0002 0x0001 0x0000 0xFFFF 0xFFFE	mperature ets. (Page 0, Base ent, 0.0125 MP _ OUT o Binary 0001 00 0000 00 0000 00 1111 11 1111 11	is higher than the e Address = 0x0E) Bit ° C/LSB, 25 ° C = 0 X data format 10 1100 0000 00 0000 0010 00 0000 000			
race and		OU".	Bit [15:0] Temperate +85 +25 + 0.0 +25 + 0.0 +25 +25 - 0.0	encoc perature 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Decin System 1	te that this tenself-heating effects E 19 TEMP_OUT (data; twos complements E 20 Example of TE Mal Hexadecimal O 0x12C0 0x0002 0x0001 0x0000 0xFFFF 0xFFFE	mperature ets. (Page 0, Base ent, 0.0125 MP _ OUT o Binary 0001 00 0000 00 0000 00 1111 11 1111 11	is higher than the e Address = 0x0E) Bit ° C/LSB, 25 ° C = 0 X data format 10 1100 0000 00 0000 0010 00 0000 000			
ΥΙΥ•ΥΛΥ⁄ Frace and I base map		OU".	Bit [15:0] Temperate +85 +25 + 0.0 +25 + 0.0 +25 +25 - 0.0	encoc perature 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Decin System 1	te that this tenself-heating effects E 19 TEMP_OUT (data; twos complements E 20 Example of TE Mal Hexadecimal O 0x12C0 0x0002 0x0001 0x0000 0xFFFF 0xFFFE	mperature ets. (Page 0, Base ent, 0.0125 MP _ OUT o Binary 0001 00 0000 00 0000 00 1111 11 1111 11	is higher than the e Address = 0x0E) Bit ° C/LSB, 25 ° C = 0 X data format 10 1100 0000 00 0000 0010 00 0000 000			
Trace and		OU".	Bit [15:0] Temperate +85 +25 + 0.0 +25 + 0.0 +25 +25 - 0.0	encoc perature 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Decin system +4800 +2 +1 0 -1 -2 -5200	te that this tenself-heating effects E 19 TEMP_OUT (data; twos complements E 20 Example of TE Mal Hexadecimal O 0x12C0 0x0002 0x0001 0x0000 0xFFFF 0xFFFE	mperature ets. (Page 0, Baselent, 0.0125 MP _ OUT of Binary 0001 00 0000 00 0000 00 0000 00 1111 11	is higher than the e Address = 0x0E) Bit ° C/LSB, 25 ° C = 0 X data format 10 1100 0000 00 0000 0010 00 0000 000			
Frace and base map		OU".	Bit [15:0] Temperate +85 +25 + 0.0 +25 + 0.0 +25 +25 - 0.0	encoc perature 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Decin system +4800 +2 +1 0 -1 -2 -5200	te that this tenself-heating effects E 19 TEMP_OUT (data; twos complements E 20 Example of TE Hexadecimal O 0x12C0 0x0002 0x0001 0x0000 0xFFFF 0xFFFE 0xEBB0	mperature ets. (Page 0, Baselent, 0.0125 MP _ OUT of Binary 0001 00 0000 00 0000 00 0000 00 1111 11	is higher than the e Address = 0x0E) Bit ° C/LSB, 25 ° C = 0 X data format 10 1100 0000 00 0000 0010 00 0000 000			

Diskette	5 Functional testing							
CA								
	5.1 Wiring method							
	If the user can access this data through the SPI port, see Figure 8 for a							
	connection diagram.							
	SYSTEM MISO MISO MOSI AK							
	Figure 8. SPI Wiring Diagram							
	5.2 Functional test The external MCU reads the register data of BS-IC24HA-M-D6EC inertial measurement unit through SPI, calculates the parameters of gyroscope and accelerometer according to the corresponding method, and verifies the							
	function of the product through the data.							
	6 Installation and adjustment The BS-IC24HA-M-D6EC three-axis gyroscope assembly is installed							
	through four Φ 2.5 through holes with screws. When installing the connector, the							
	plug should correspond to each pin of the socket and be fixed by screws.							
	It is recommended that the flatness of the mounting surface opposite to the							
X IV- V ACV	reference surface shall not be greater than 0.02 mm, the verticality shall not be							
	greater than 0.04 mm, and the surface roughness shall not exceed 0.8 $\mu m.$							
Trace and								
Old base map								
ora oase map								
Base map	BS-IC24HA-M-D6EC R2.900.005SM							

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Signature,

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Diskette	_	7 O pe	eration a	and maintenance require	ments						
CA		-		-		em mus	st be checked to				
	Before use, the installation position of the system must be checked to ensure correct installation. Carefully check the connection of each signal line to ensure that the connection is correct.										
		Before power-on, check the cable network contact and power supply									
		value, and the power supply polarity shall not be reversed. In use, the mechanical grounding of the system shall be well									
		groun		8	8	J					
				duct should be stored in a	well-ventil	ated wa	arehouse with a				
			_	of $(15 \sim 35)$ °C, a relative							
		_		id, alkali and corrosive gas	-		,				
				_							
		Appe	naix A I	Packing List							
				BS-IC24HA-M-D0							
		Seria	l number	Name	Quantity	Unit Pcs Pcs	Remark				
			1	BS-IC24HA-MD6EC products	1						
					1						
			4	-							
			5	Product packing box	1	A					
			3 4 5	Product certificate Instructions for use Packing list Product packing box	1	Pcs Pcs					
ΛΙΨ-ΛΛΩν Traces and	- -										
Trace and	1										
	4										
Old base map	- 										
				BS-IC24H	IA-M-D6E0	C	R2.900.005SM				