File number	Piece number

File Number TYS-NST5SA1-IDS

Stage mark FM

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NST5S-A1 Star Tracker IDS

Signature

Edit ： Fu Shuxin

Proofreading ： Wang Hongqiang

Check ： Xiao Mingguo

Standard check： Chai Yin

Approval ： Wang Haijun

TY-Space Technology (Beijing) Ltd.

IDS 1：Performance Index

	File number	TYS-NST5SA1-IDS				
	Sub-system name					
	Device name	NST5SA1 Star Tracker	Stage mark			
	Device code				FM	

Attitude Accuracy	Pointing: 2″ (3 σ) Rolling: 15″ (3 σ)
Dynamic Range	@ 0.1°/s: 2″ (Pointing, 3 σ); 15″ (Rolling, 3 σ); @0.5°/s: 5″ (Pointing, 3 σ); 35″ (Rolling, 3 σ); @1.0°/s: 7″ (Pointing, 3 σ); 50″ (Rolling, 3 σ); @ 3° /s: follow up
Data Validity	>98%@ 0.5°/s; >96%@0.5°/s ~1.5°/s;
Update Rate	≥10Hz
Acquisition Rate	Max. ≤2s
Start-up Time	Better than 5s
Exclusive Angle	Sun:better than 35°; Earth: better than 25°
Timing Accuracy	0.1ms @ synchronization pulse（SYNC pulse）
Quaternion Continuity	the scalar of quaternion: non-negative
Life Time	7years @1000Km Orbit
Communication	RS422/CAN
Reliability	≥0.98 @ the end of 5 years running

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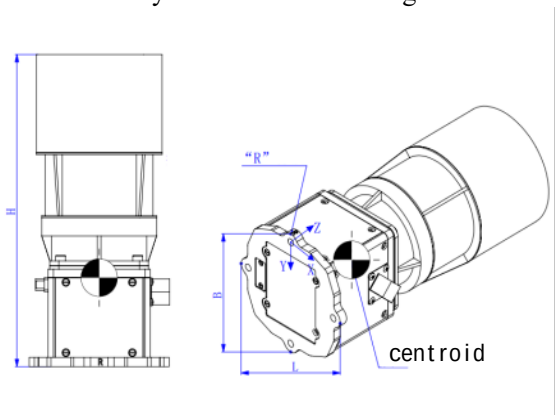
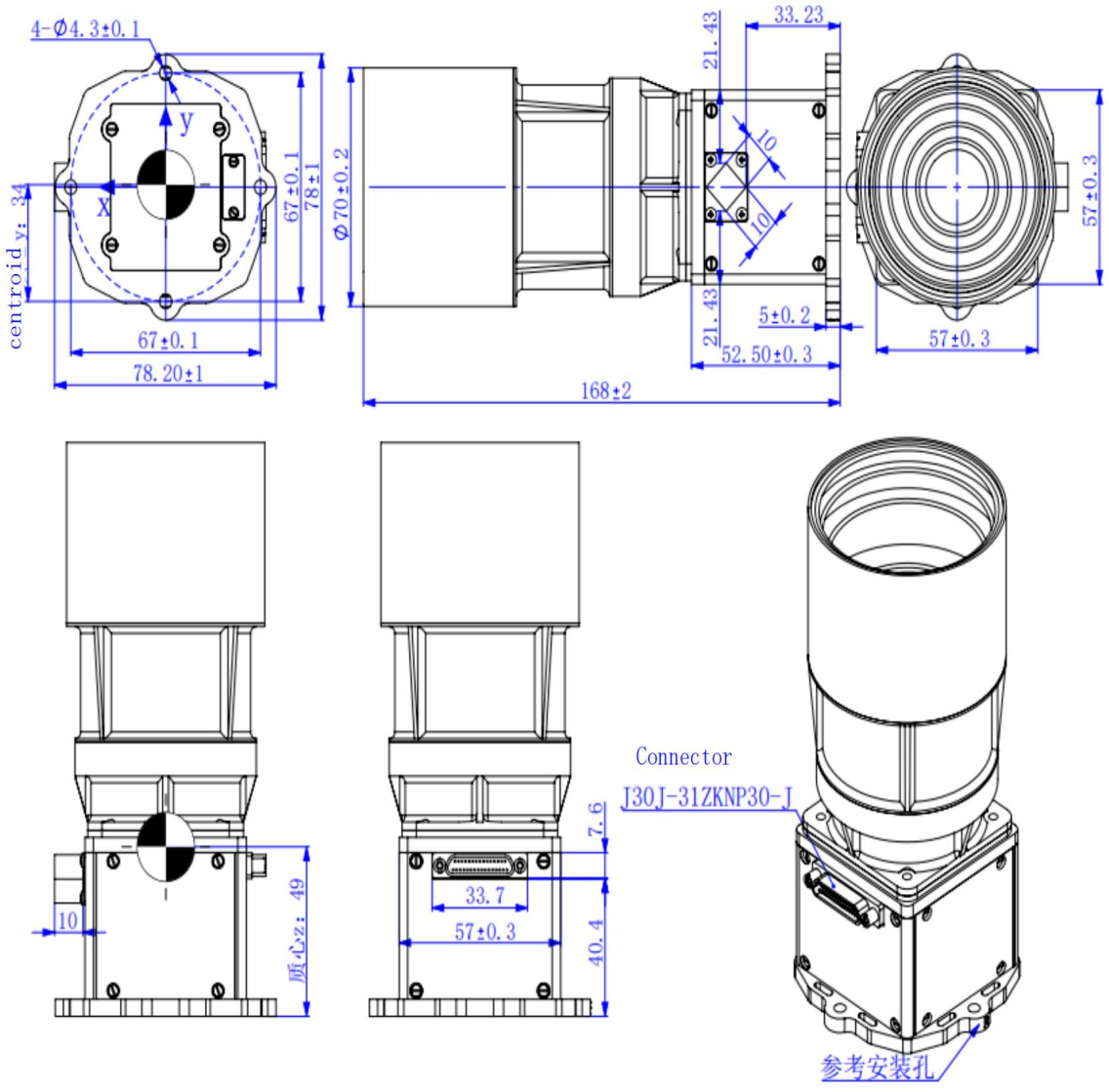
IDS 2：Mechanical Characteristics

<table>
<tr><td colspan="3" rowspan="4"></td><td>File number</td><td>TYS-NST5SA1-IDS</td><td colspan="3"></td></tr>
<tr><td>Sub-system name</td><td></td><td colspan="3"></td></tr>
<tr><td>Device name</td><td>NST5SA1 Star Tracker</td><td colspan="3">Stage mark</td></tr>
<tr><td></td><td></td><td></td><td>FM</td><td></td></tr>
<tr><td colspan="3">Device weight[note] 420g±20g</td><td colspan="2">Device number：</td><td></td><td>√</td><td></td></tr>
<tr><td rowspan="3">Weight characteristics</td><td>Envelope size mm</td><td colspan="2">Envelope diameter：78.2±1×78±1</td><td>Height：168±2</td><td></td><td>√</td><td></td></tr>
<tr><td>Centroid position mm</td><td>X：0±2</td><td>Y：34 ± 2</td><td>Z：49 ± 2</td><td></td><td>√</td><td></td></tr>
<tr><td>Inertia of centroid kg.mm²</td><td>P_X = 784 ±3</td><td>P_Y =792±3</td><td>P_Z =282±3</td><td></td><td>√</td><td></td></tr>
<tr><td rowspan="6">Installation characteristics</td><td colspan="2">Installed holes number：4</td><td colspan="2">Size of installed holes（tolerance）mm：Φ4.3±0.1</td><td colspan="3">Material:2A12-T4</td></tr>
<tr><td colspan="2">Installation contacting area mm² ：2183</td><td colspan="4" rowspan="5">Note：</td></tr>
<tr><td colspan="2">Installation surface flatness：0.1mm</td></tr>
<tr><td colspan="2">Installation surface roughness Ra μm: 3.2μm</td></tr>
<tr><td colspan="2">Installation surface flatness：0.1mm/100mm×100mm</td></tr>
<tr><td colspan="2">Installation surface state：the installation area is oxidized by conduction, and the remaining area is oxidized black.</td></tr>
<tr><td colspan="8">Parameter relationship diagram:
Note: the determination method refers to the way to determine the weight of device.
 

Note：The origin of the coordinates lies in the geometric center of the outer surface of the lower shell (see "Instrument diagram");</td></tr>
<tr><td colspan="3">Edited（Date）：</td><td></td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td colspan="3">Signed（Date）：</td><td>Mark</td><td colspan="2">Changed number</td><td colspan="2">Signature, date</td></tr>
</table>

IDS 3：Instrument Diagram

	File number	TYS-NST5SA1-IDS				
	Sub-system name					
	Device name	NST5SA1 Star Tracker	Stage mark			
	Device code				FM	



Note: This sketch should include body size, mounting size, mounting plane, mounting point (aperture and its tolerances, center distance and its tolerances), position tolerances for guide pins and holes, direction, location, type and number of electrical connectors , the operating hole, the lap (position and length), the registration measurement reference for calibration and testing.

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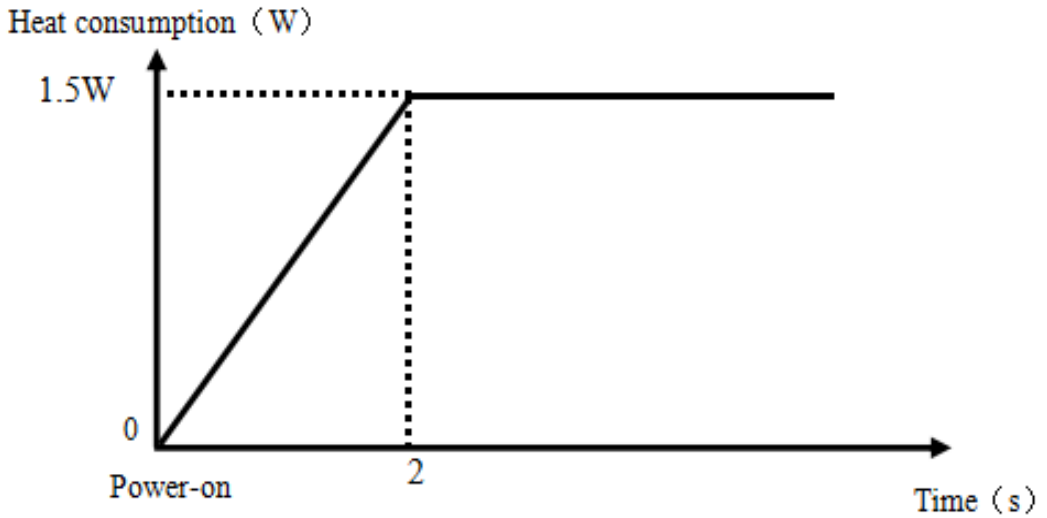
IDS 4：Thermal characteristics

	File number	TYS-NST5SA1-IDS					
	Sub-system name						
	Device name	NST5SA1 Star Tracker	Stage mark				
	Device code				FM		

Surface (except for mounting surface)	Aluminum alloy（2A12-T4）	Note: The inner surface of the baffle is treated with ultra black coating，ε_H：≥0.85，α_S：≥0.96
	Outside surface treatment: Black anodized	
	ε_H：≥0.6	
	Preparing state heat consumption W：0（per device）	

Start temperature ℃：-30~+40	Heat capacity J/K：340
Operating temperature range ℃：-30~+40	The best operating temperature range ℃：20±5
Storage temperature range ℃：-30~+40	Operating relative humidity range： ≤60 %
Operating state heat consumption W：1.5（per device）	Storage relative humidity range：≤70 %

Description:



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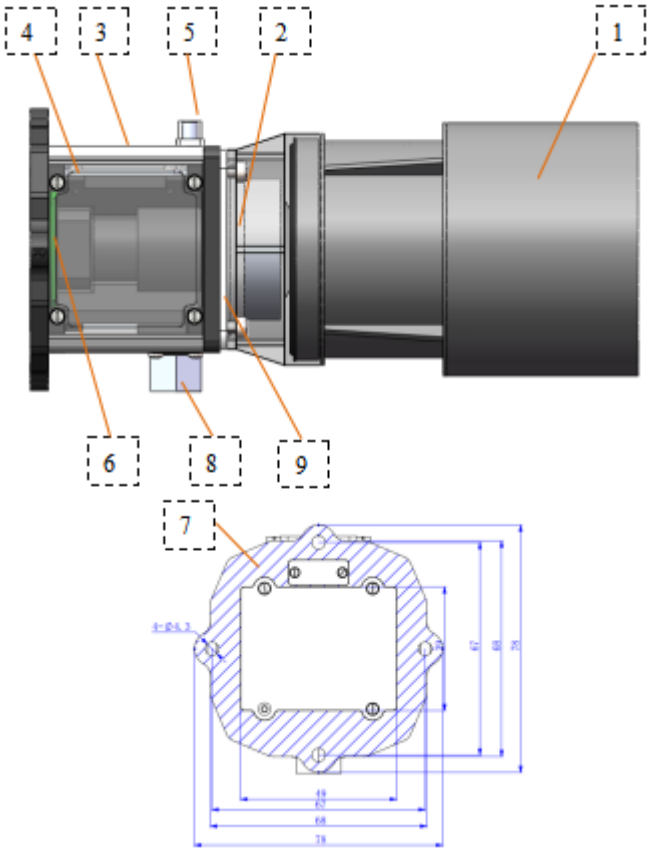
IDS 5：Thermal Diagram

	File number	TYS-NST5SA1-IDS				
	Sub-system name					
	Device name	NST5SA1 Star Tracker	Stage mark			
	Device code				FM	

Diagram：



1－Baffle　　2－Lens
3－Circuit box　　4－Power and image processing circuit board
5－Connector　　6－Image sensor & Circuit board
7－Installing lugs（Contact surfaces）　　8－Prism　　9－2mm Polyimide insulation gasket

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IDS 6：Power

	File number	TYS-NST5SA1-IDS				
	Sub-system name					
	Device name	NST5SA1 Star Tracker	Stage mark			
	Device code				FM	

Working mode (long term/short term/others）	Long term	Single non-long-term power-up working hours S		Device number	1

Voltage V	Voltage stability %	Ripple voltage mV （P-P）	Device starting current characteristics （peak/duration）	Power W
4.8-5.4	\	100	2A/5ms	1.5±0.2W

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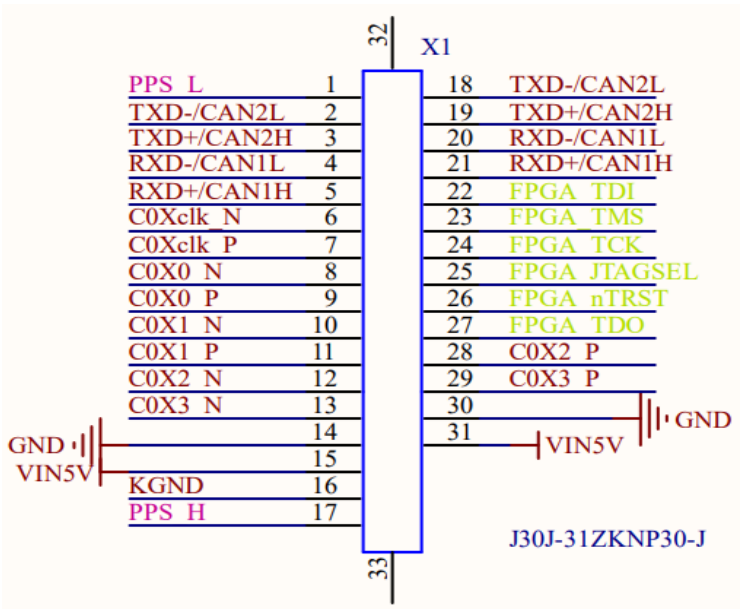
IDS 7: Electrical Connector Contact Assignment-X1

	File number	TYS-NST5SA1-IDS	
	Sub-system name		
	Device name	NST5SA1 Star Tracker	Stage mark
	Device code		FM

Name (by function)	X1	Electrical connector code	J30-31ZKNP30-J	Needle / Hole	Hole

Contact number	Signal (function) description	Voltage/V	Current/A	Polar	Remarks (shielded / twisted)
15，31	VIN5V	5V	0.3A	Power	two-point two-wire
14，30	GND	0V	0.3A	Power Ground	two-point two-wire
3，19	TXD+/CAN2H	RS-422 Standard	RS-422 Standard	422 Transmit+	2，3 twisted；18，19 twisted
2，18	TXD-/CAN2L			422 Transmit-	
5，21	RXD+/CAN1H	RS-422 Standard	RS-422 Standard	422 Receive+	4，5 twisted；20，21 twisted
4，20	RXD-/CAN1L			422 Receive-	
17	PPS_H	RS-422 Standard	RS-422 Standard	PPS Receive+	1，17 twisted；
1	PPS_L			PPS Receive-	
22	FPGA_TDI				Internal use, prohibit external use
23	FPGA_TMS				
24	FPGA_TCK				
26	FPGA_nTRST				
27	FPGA_TDO				
25	FPGA_JTAGSEL				
6	C0Xclk_N	LVDS Standard	LVDS Standard	CameraLink0Xclk-	Twisted shield
7	C0Xclk_P			CameraLink0Xclk+	
8	C0X0_N	LVDS Standard	LVDS Standard	CameraLink0X0-	Twisted shield
9	C0X0_P			CameraLink0X0+	
10	C0X1_N	LVDS Standard	LVDS Standard	CameraLink0X1-	Twisted shield
11	C0X1_P			CameraLink0X1+	
12	C0X2_N	LVDS 标准	LVDS 标准	CameraLink0X2-	Twisted shield
28	C0X2_P			CameraLink0X2+	
13	C0X3_N	LVDS 标准	LVDS 标准	CameraLink0X3-	Twisted shield
29	C0X3_P			CameraLink0X3+	
16	KGND				Package ground



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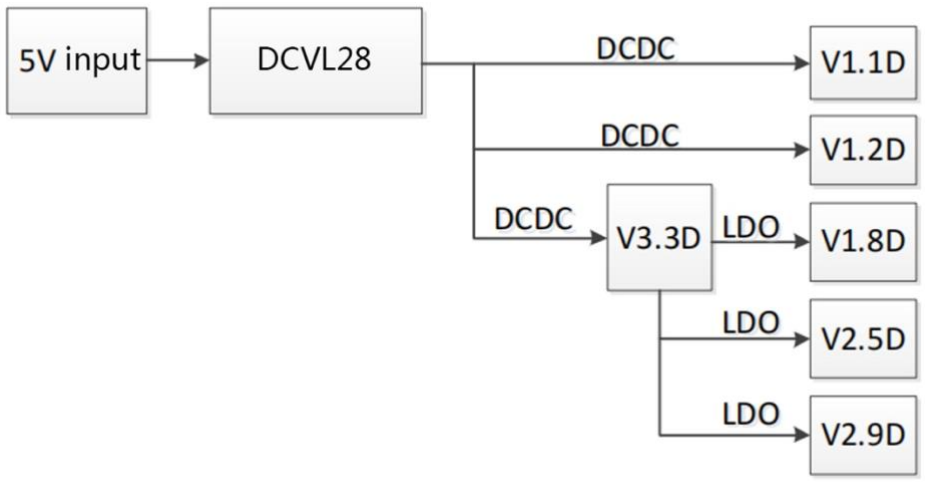
IDS 8 : Electrical Interface Features-Power

	File number	TYS-NST5SA1-IDS				
	Sub-system name					
	Device name	NST5SA1 Star Tracker	Stage mark			
	Device code				FM	

Interface signal	Power supply
Signal characteristics	5V power and the ground are two-point two-wire.
Interface Circuit	
Explanation	

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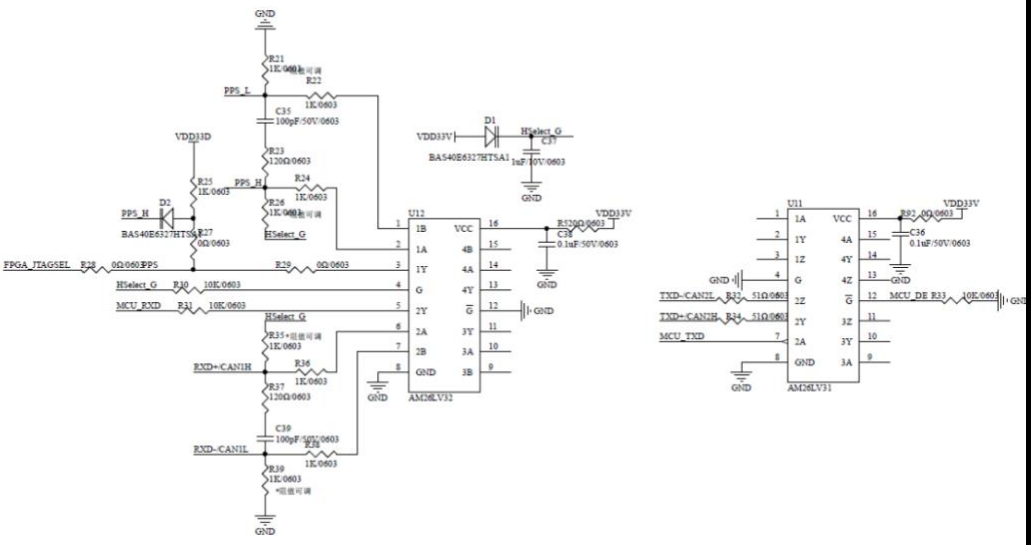
IDS 9： Electrical Interface Features-RS422

	File number	TYS-NST5SA1-IDS	
	Sub-system name		
	Device name	NST5SA1 Star Tracker	Stage mark
	Device code		FM

Interface signal	Digital signal, RS422.
Signal characteristics	422 communication baud rate: 115200bps;The starting bit is one, the data bit is eight bits (the low bit precede the high bit), the stop bit is one, odd parity,one bit two-point two-wire
Interface circuit	
Explanation	

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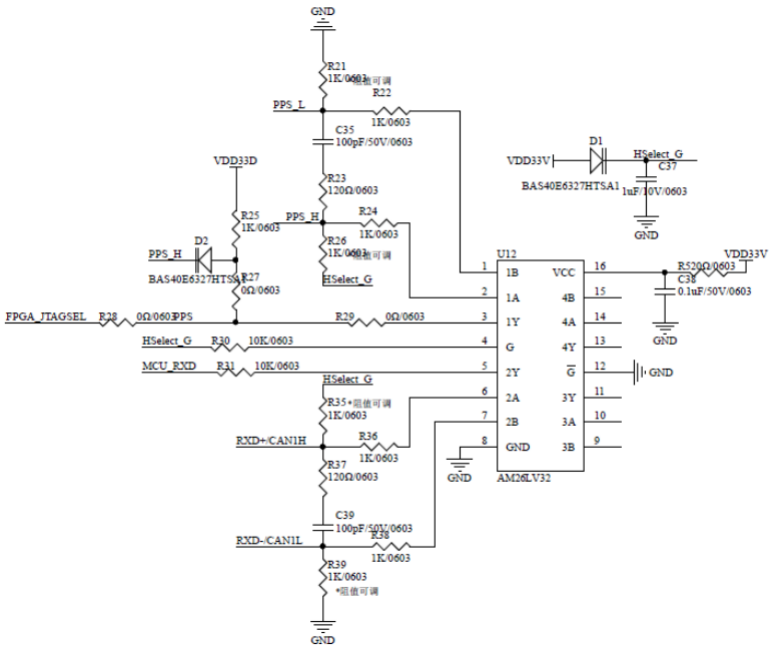
IDS 10：Electrical Interface Features-Second pulse (Different)

	File number	TYS-NST5SA1-IDS				
	Sub-system name					
	Device name	NST5SA1 Star Tracker	Stage mark			
	Device code				FM	

Interface signal	Different Second pulse
Signal characteristics	@ Differential second pulse, the second integer is aligned by the lower edge, and the negative pulse width is 1ms.
Interface circuit	Seconds pulse circuit 
Explanation	R25、R27 and D2 are not weld @different second pulse.

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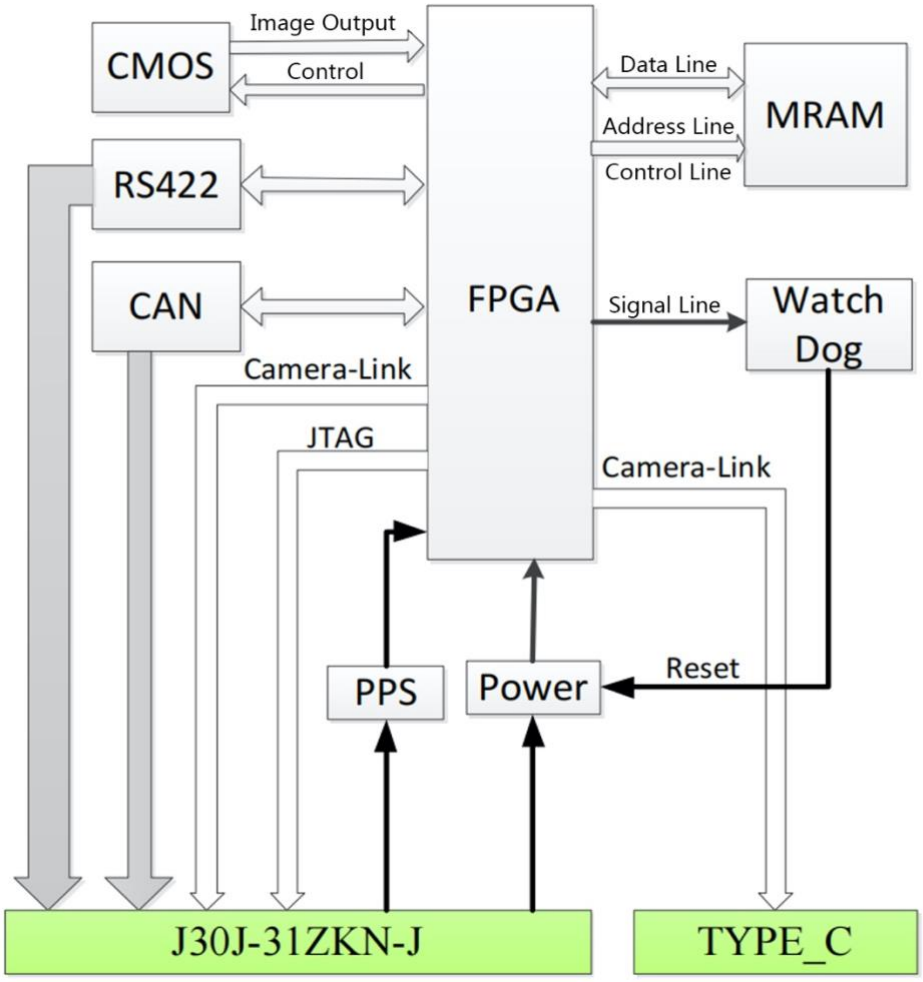
IDS 11：Circuit and Interface Schematics

	File number	TYS-NST5SA1-IDS				
	Sub-system name					
	Device name	NST5SA1 Star Tracker	Stage mark			
	Device code				FM	

Simplified diagram：



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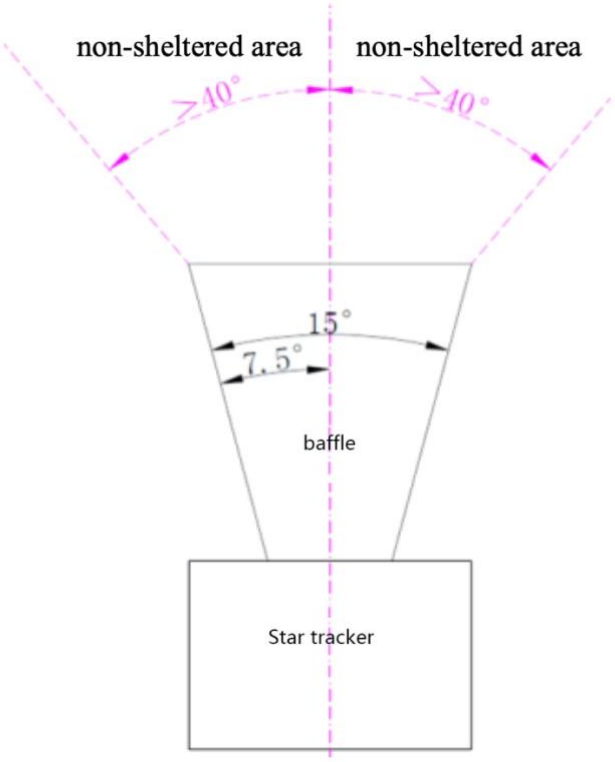
IDS 12：Installation requirements

	File number	TYS-NST5SA1-IDS			
	Sub-system name				
	Device name	NST5SA1 Star Tracker	Stage mark		
	Device code				F M

Be sure: Nothing sheltered in the field of view: the circular cone of 80° around the top of the Baffle.



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IDS 13：Device Description

	File number	TYS-NST5SA1-IDS				
	Sub-system name					
	Device name	NST5SA1 Star Tracker	Stage mark			
	Device code				FM	

Note: the special requirements for the interface and other inconvenient presentation are described in this section.

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