File number	Piece number

File Number TYS-NST5SA1-IDS

Stage mark FM

Page 15

NST5S-A1 Star Tracker IDS

Signature

Edit ： FUSHUXIN

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Check ： XIAO MINGGUO

Standard check： CHAIYIN

Approval ： WANGHAIJUN

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	0.5ms @ synchronization pulse（SYNC pulse）
Quaternion Continuity	the scalar of quaternion: non-negative
Life Time	5years @500Km Orbit
Communication	422
Reliability	≥0.98 @ the end of 5 years running

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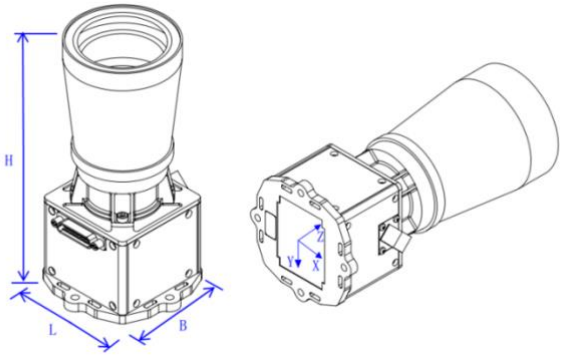
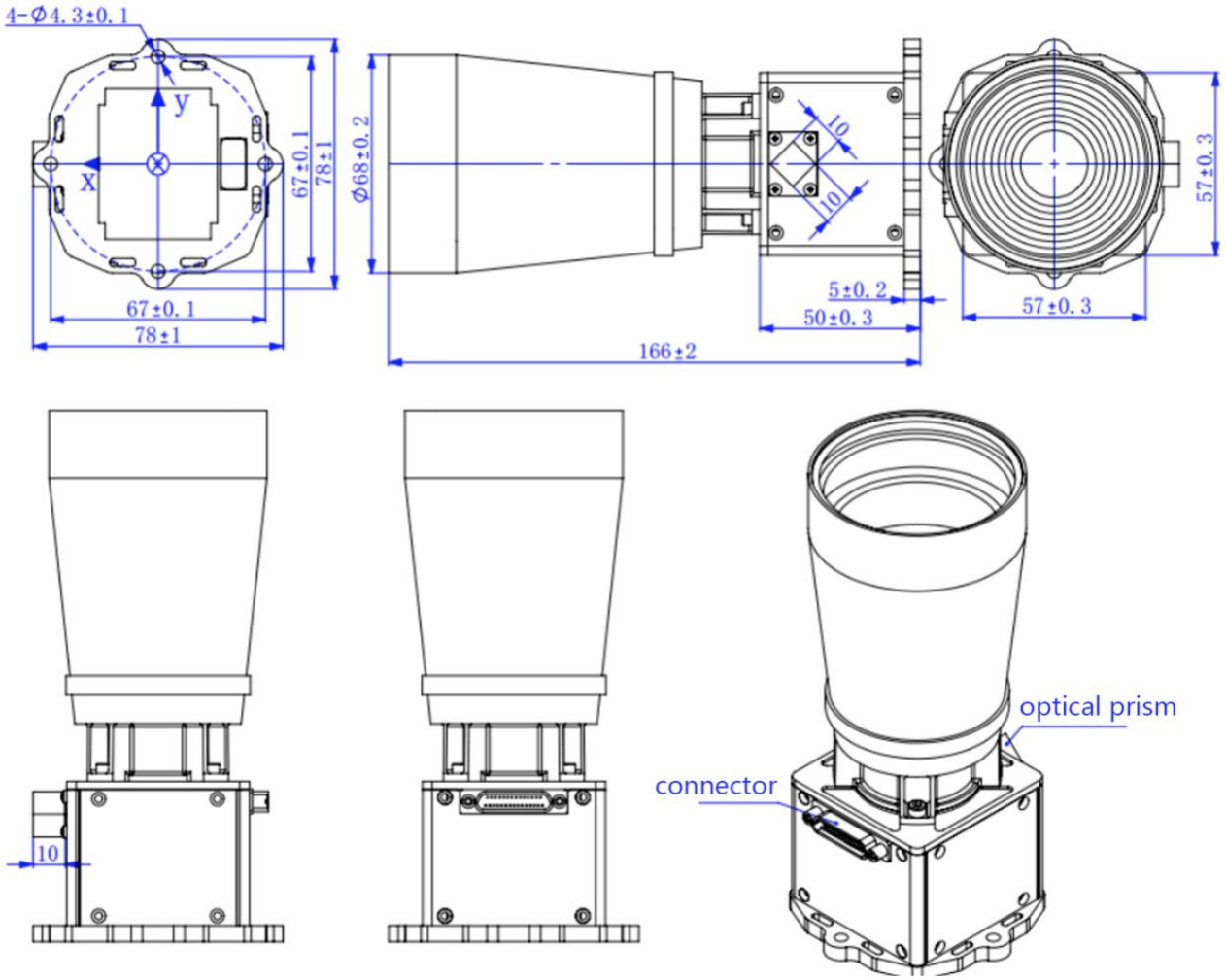
IDS 2：Mechanical Characteristics

<table>
<tr><td colspan="3" rowspan="4"></td><td>File number</td><td colspan="2">TYS-NST5SA1-IDS</td><td colspan="3"></td></tr>
<tr><td>Sub-system name</td><td colspan="2"></td><td colspan="3"></td></tr>
<tr><td>Device name</td><td colspan="2">NST5SA1 Star Tracker</td><td colspan="3">Stage mark</td></tr>
<tr><td></td><td colspan="2"></td><td></td><td>FM</td><td></td></tr>
<tr><td colspan="3">Device weight[note] 380g±30g</td><td colspan="2">Device number：</td><td></td><td>√</td><td></td></tr>
<tr><td rowspan="4">Weight characteristics</td><td>Envelope size mm</td><td colspan="2">Envelope diameter：Φ78±1</td><td>Height：166±2</td><td></td><td>√</td><td></td></tr>
<tr><td>Centroid position mm</td><td>X：-0.296</td><td>Y：0.589</td><td>Z：43.885</td><td></td><td>√</td><td></td></tr>
<tr><td rowspan="2">Inertia of centroid kg.mm^2</td><td rowspan="2">P_X = 642.393</td><td rowspan="2">P_Y =650.065</td><td rowspan="2">P_Z =220.637</td><td></td><td>√</td><td></td></tr>
<tr><td>Mea-sure-ment</td><td>Calc-ulatio-n</td><td>Esti-mate</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>Material:2A12-T4</td><td colspan="3">Determination method（√）</td></tr>
<tr><td colspan="3">Installation contacting area mm^2 ：2200</td><td colspan="5" rowspan="5">Note：</td></tr>
<tr><td colspan="3">Installation surface flatness：0.1mm</td></tr>
<tr><td colspan="3">Installation surface roughness Ra μm: 3.2μm</td></tr>
<tr><td colspan="3">Installation surface flatness：0.1mm/100mm×100mm</td></tr>
<tr><td colspan="3">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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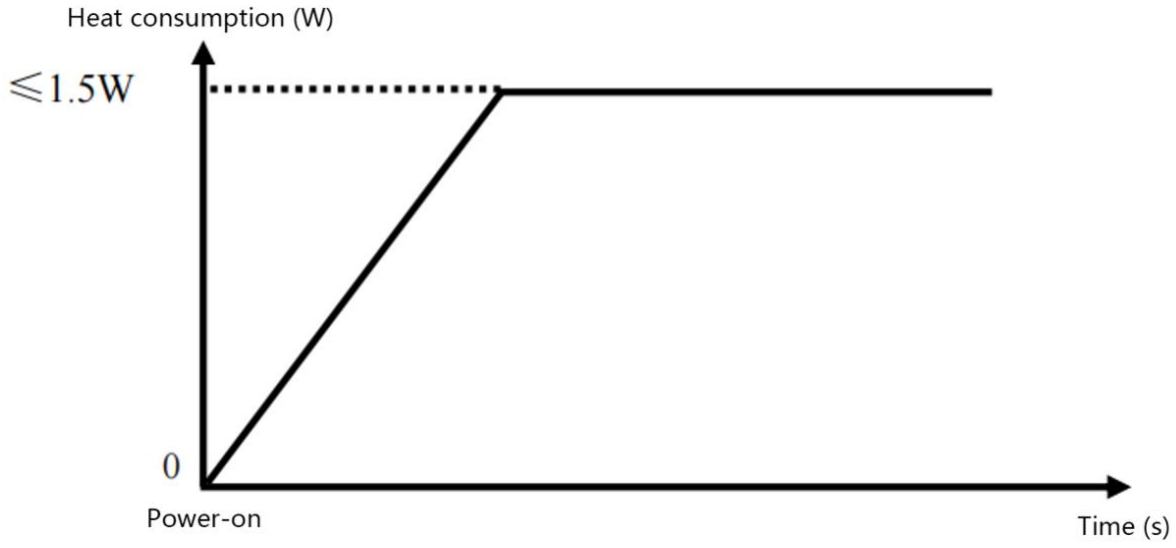
IDS 4：Thermal characteristics

	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：≥0.85	
	Preparing state heat consumption W：0（per device）	

Start temperature ℃：-40~+45	Heat capacity J/K：380
Operating temperature range ℃：-40~+45	The best operating temperature range ℃：0~+10
Storage temperature range ℃：-40~+45	Operating relative humidity range： ≤60 %
Operating state heat consumption W：1.5（per device）	Storage relative humidity range：≤70 %

Description:



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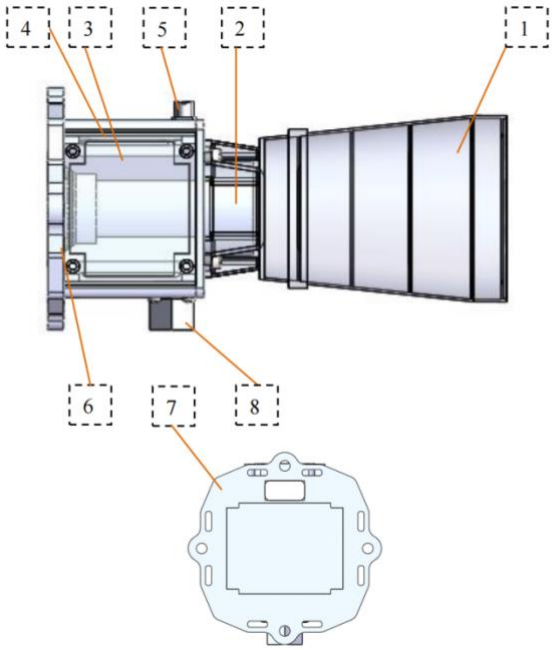
IDS 5：Thermal Diagram

	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

The structure of　PST4S-H1 Star Tracker is shown as above:
Image sensor & Circuit board＜0.5±0.1W
Power and image processing circuit board＜0.5±0.1W

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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
5	5%	100	2A/5ms	≤1.5W

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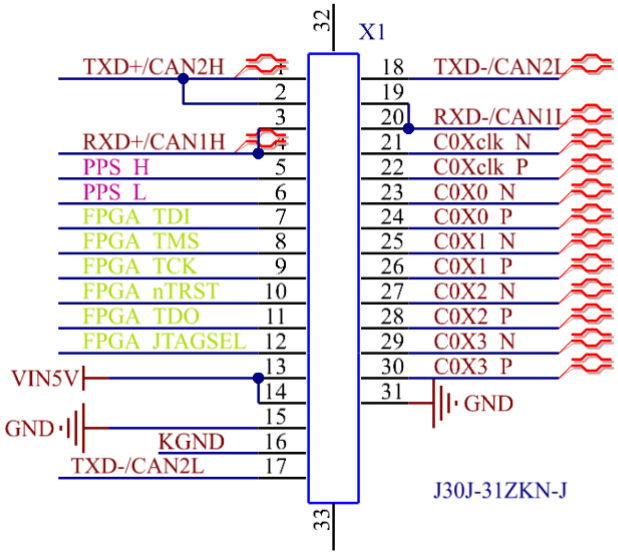
IDS 7: Electrical Connector Contact Assignment-X1

	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	J30J-31ZKN-J	Needle / Hole	Hole

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



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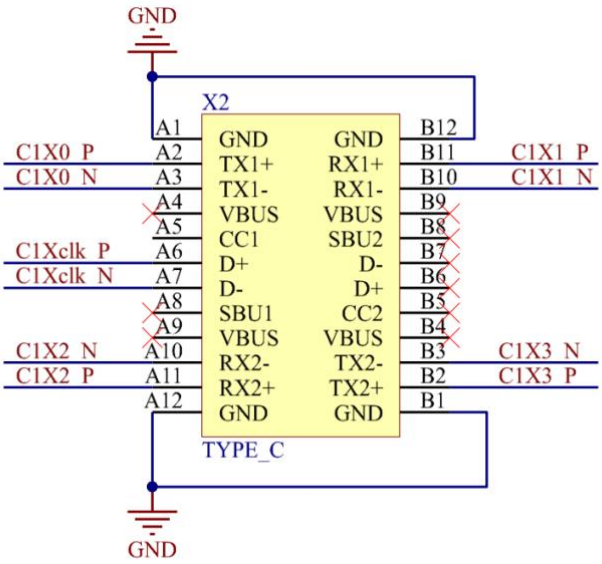
IDS 8: Electrical Connector Contact Assignment-X2

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

Name (by function)	X2	Electrical connector code	TYPE_C	Needle / Hole	Hole

Contact number	Signal (function) description	Voltage/V	Current/A	Polar	Remarks (shielded / twisted)
A7	C1Xclk_N	LVDS Standard	LVDS Standard	CameraLink1Xclk-	Twisted shield
A6	C1Xclk_P			CameraLink1Xclk+	
A3	C1X0_N	LVDS Standard	LVDS Standard	CameraLink1X0-	Twisted shield
A2	C1X0_P			CameraLink1X0+	
B10	C1X1_N	LVDS Standard	LVDS Standard	CameraLink1X1-	Twisted shield
B11	C1X1_P			CameraLink1X1+	
A10	C1X2_N	LVDS Standard	LVDS Standard	CameraLink1X2-	Twisted shield
A11	C1X2_P			CameraLink1X2+	
B3	C1X3_N	LVDS Standard	LVDS Standard	CameraLink1X3-	Twisted shield
B2	C1X3_P			CameraLink1X3+	
A1,A12,B1,B12	GND	0V		Power Ground	



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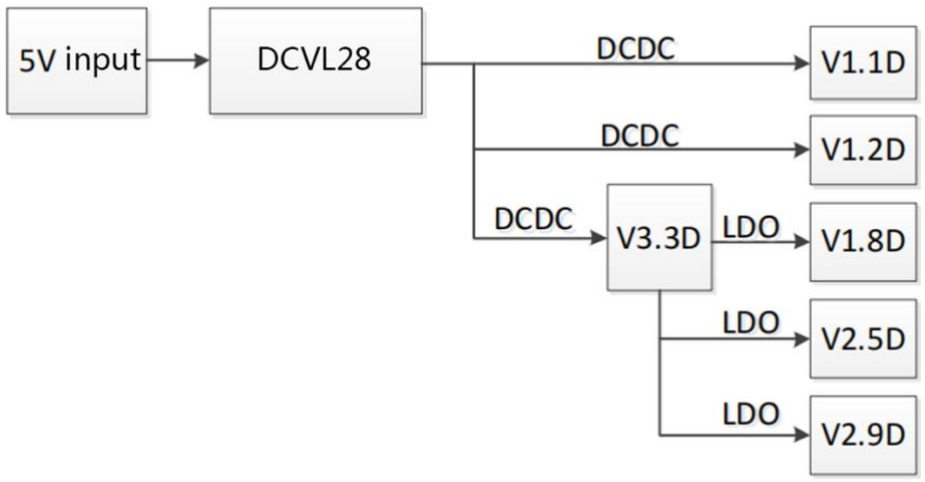
IDS 9: Electrical Interface Features-Power

	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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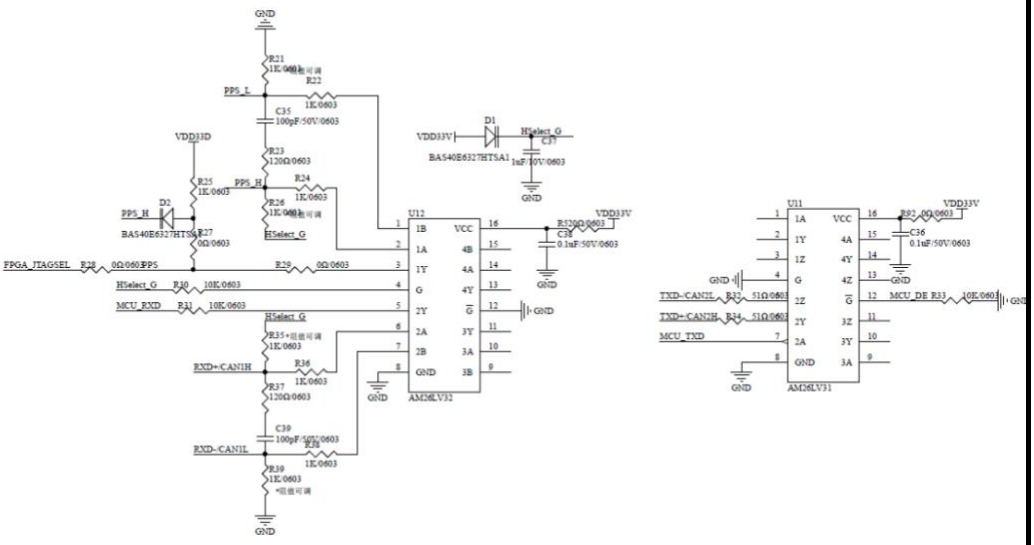
IDS 10：Electrical Interface Features-RS422

	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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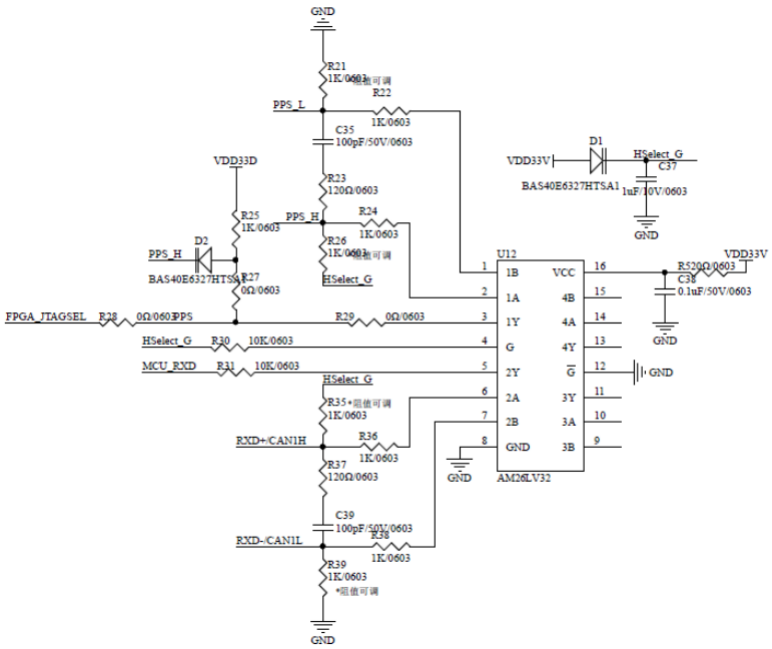
IDS 11：Electrical Interface Features-Second pulse (Different)

	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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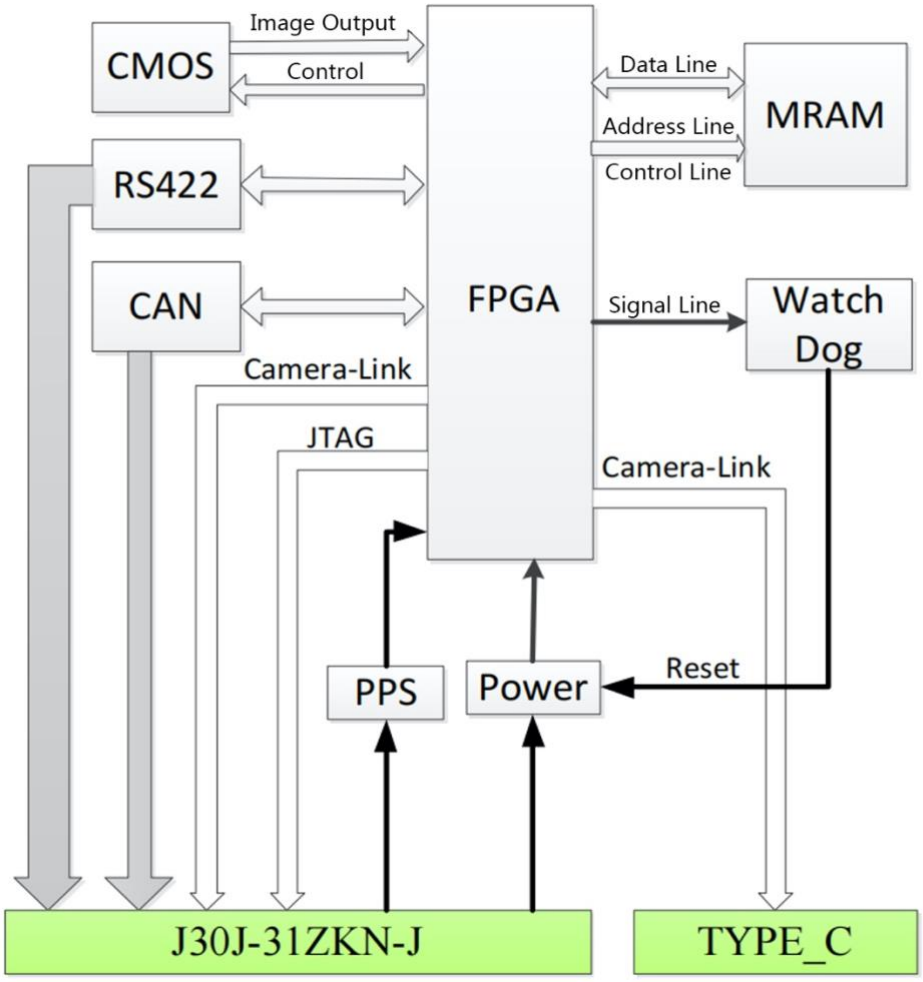
IDS 12：Circuit and Interface Schematics

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

Simplified diagram：



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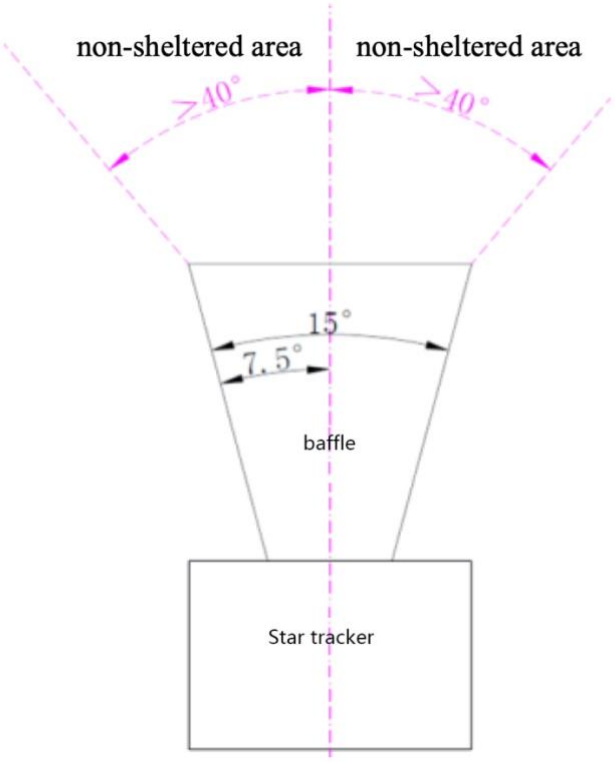
IDS 13：Installation requirements

	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 14：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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