S3107A

Single-channel Optical Receiving Module User's Guide

Version V1

Contents

1. Product Description

S3107A is a miniature SDI video optical receiver module. The component supports 3G-SDI and SMPTE424M protocols, the transmission rate is 270Mbps to 2.97Gbps, the working temperature is -55°C to 85°C, the optical interface adopts a customized 8# optical pin interface, the electrical interface is 8-pin soldering pins, and the module package size is Φ8mm×24.7mm.

The schematic diagram of the appearance of the product is shown in Figure 1.

*It is only a schematic diagram of the product effect, and the actual product shall prevail for details

Figure 1 Schematic diagram of appearance effect

2. Product Features

- 8# optical pin interface, 62.5/125um optical interface
- Supports SMPTE424M protocol
- 270Mbps～2.97Gbps transmission rate
- Dimensions: Φ8mm×24.7mm
- Embedded in the connector, installed on the 8# four-coaxial contact piece node
- Signal GND and shell common ground

3. Product Ordering Information

Partnumber for Order: **S3107A**

4. Product Performance Indicators

4.1. Absolute Maximum Ratings

Table 2 Absolute Maximum Ratings

Parameter	Symbol	Unit	Value		Remark
			Min. value	Max. value	
Supply voltage	V_{CC}	V	0	3.60	-
Control signal input voltage	$V_{car\text{-}in}$	V	0	V_{CC}	-
Storage temperature	T_{stg}	℃	- 55	100	-
Relative humidity	RH_o	%	5	85	-
ESD protection value 1	*ESD1*	V	-	2200	-
Soldering temperature	T_{sold}	℃	-	260	-
Welding time	t_{sold}	s	1	3	-
Welding times	N_{sold}	Second-rate	1	2	-
Note: Use beyond the above limit conditions may cause irreversible damage to the product. It is not recommended to work under extreme working conditions.					

4.2 Recommended Working Conditions

Table 3 Recommended Working Conditions

Description	Symbol	Value			Unit	Remark
		Min. value	Typical value	Max. value		
Operating voltage	V_{CC}	3.135	3.30	3.465	V	–
Operating temperature	T_{amb}	- 55	25	85	℃	–
Power supply ripple	*VSND*	-	-	+200	mV	peak-to-peak
Differential Output Matched Impedance	Z_{out}	-	100	-	Ω	–
Transmission rate	*S*	0.27	-	2.97	Gbps	–

4.3. Product Photoelectric Performance

Table 4 Photoelectric Performance Index

Description	Symbol	Value			Unit	Remark
		Min. value	Typical value	Max. value		
Working current	I_{cc}	-	-	95	mA	-
Power consumption	P	-	-	0.328	W	-
Receiving photoelectric characteristics (-55℃～85℃, 2.97Gbps, PRBS 2^{23}-1, V_{CC}=3.30V)						
Description	Symbol	Value			Unit	Remark
		Min. value	Typical value	Max. value		
Receiver sensitivity	P_{in}	-	-	- 19	dBm	BER≤10^{-12}
Saturation optical power	P_{in} (SAT)	0	-	-	dBm	-
Receiving wavelength	λ	1100	1310	1650	nm	-
Differential Signal Output Voltage	$V_{diff-out}$	400	720	820	mV	peak-to-peak
No-light alarm optical power	P_A	-28	-	-	dBm	-
To alarm optical power	P_D	-	-	-20	dBm	-
Alarm Hysteresis	PH_r	1.5		3.5	dB	-
Electrical signal rise/fall time	T_r / T_f	-	-	135	ps	-
Electrical signal jitter	J_{p-p}	-	-	135	ps	P-P

5. Interface definition

5.1 Definition of electrical interface

For the electrical interface, the pin definition of the electrical interface is shown in Figure 2.

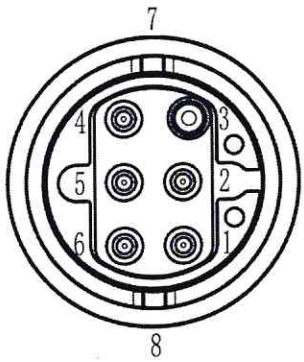


Figure 2 Definition diagram of electrical pins

Table 5 Pin definition description

Serial number	Name	Level type	I/O	Pin description	Remark
1, 3, 7, 8	GND	Power supply	–	Basic grounding	–
2	Vcc	Power supply	input	Power supply	–
4	LOS	CMOS open-drain output	output	Receive alerts.High: receive no light warning, low: receive normally. Externally connected to 10kΩ pull-up.	–
5	Rx-	CML	output	The negative pole of the data output needs an external 10uF coupling capacitor	–
6	Rx+	CML	output	The positive pole of the data output needs an external 10uF coupling capacitor	–

5.2 Optical interface definition

Facing the optical interface, the optical interface is shown in Figure 2, and the typical diameter of the ceramic ferrule is 2.5mm.

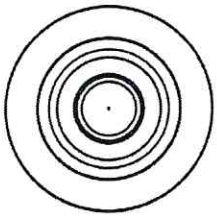


Figure 3 Optical interface definition diagram

6. Dimensions

The external dimensions of the optical module conform to the external dimensions of the 8# four-coaxial pin contact after removal, as shown in Figure 4, unit: mm, tolerance ±0.2 not noted.

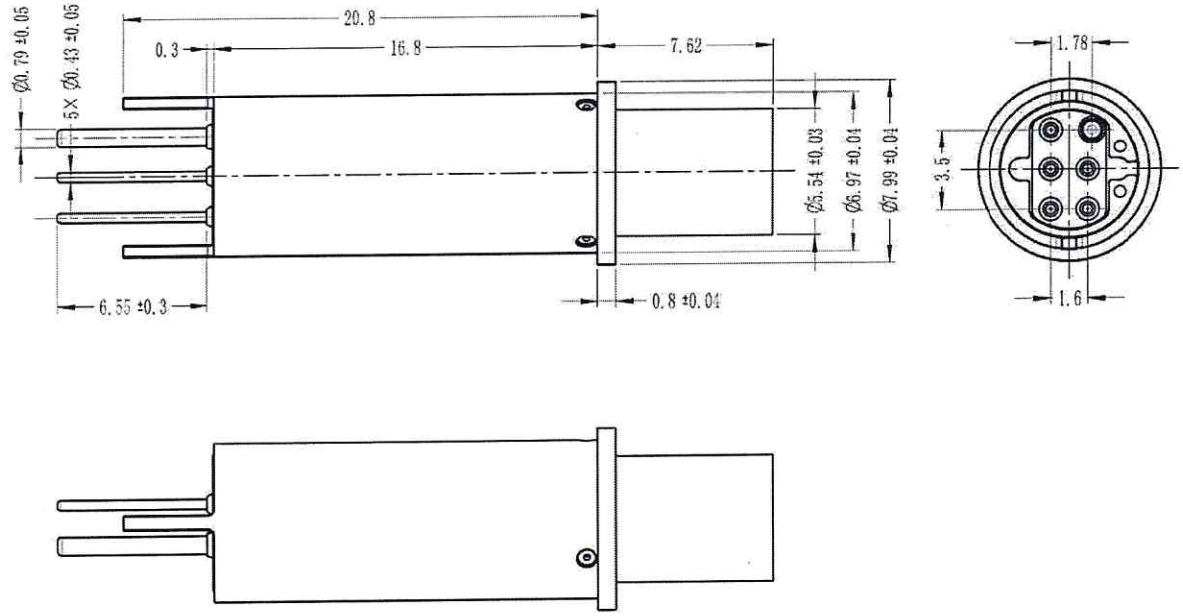


Figure 4 Module Dimensions

7. Application Design Guide

7.1 Recommended circuit for peripheral configuration

Refer to the peripheral filter circuit shown in Figure 5.

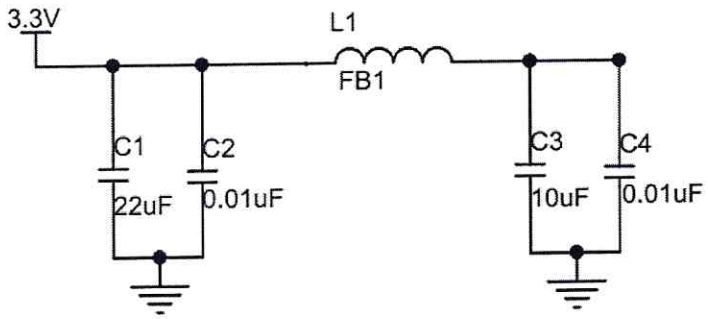


Figure 5 reference peripheral filter circuit

The peripheral configuration circuit diagram is shown in Figure 6.

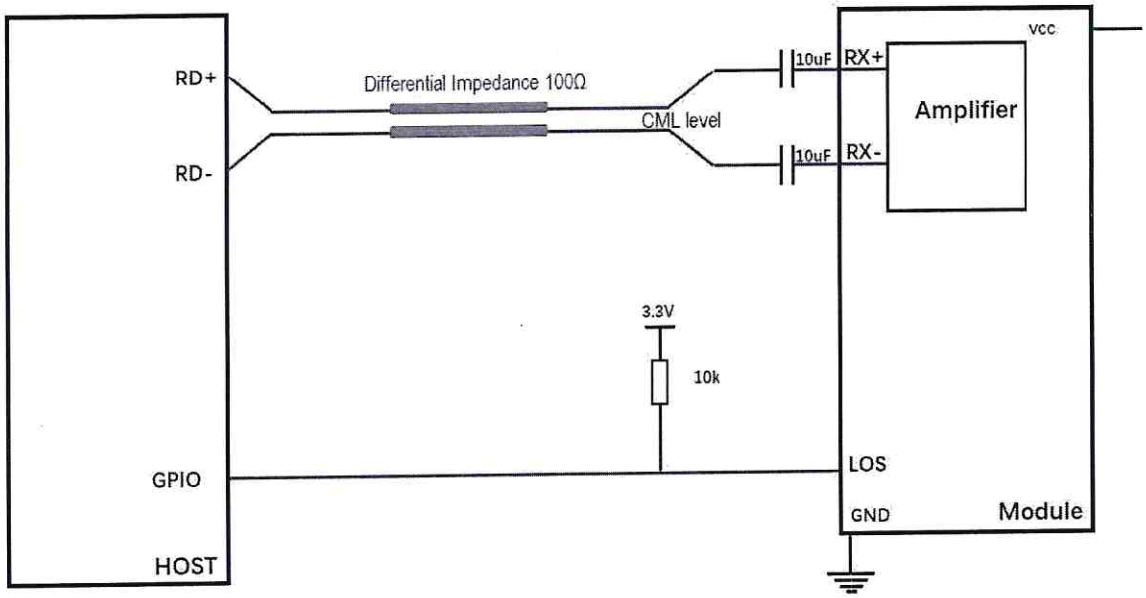


Figure 6 Recommended peripheral configuration

Design Considerations:

- The inductance in the power filter circuit must have sufficient overcurrent capability;
- High-speed signal traces ensure differential 100Ω;
- The high-speed signal between HOST and the module adopts AC coupling design, and it is recommended to design a 10uF coupling capacitor;
- In the high-speed signal path, the via hole is a key point that affects the impedance, and it should be paid attention to in Layout;
- The signal GND is shared with the shell;
- The recommended circuit is for reference only.

7.2 Power adaptability

In order to ensure the stable and reliable operation of the module, the user should pay attention to the following items when using it:

a) The load capacity of the power supply module on the main board should be sufficient. Each optical module needs to place a filter circuit as close as possible to the power pin of the module to filter the power supply. Refer to the design of the power supply in Figure 5. The inductance in the filter circuit must have sufficient overcurrent capability, and the inductance value can be adjusted appropriately;

b) The module can only be used within the limit power supply voltage range. If the limit voltage is exceeded, the module may be irreversibly damaged. Only within the recommended index range can the module work stably and reliably for a long time;

c) It is recommended that the power supply noise amplitude of the input module is less than 100mVpp, and the frequency is less than 5MHz.

8. Recommended PCB LAYOUT Design

a) The PCB Layout design package diagram of the optical module product corresponding to the user's motherboard is shown in Figure 7.

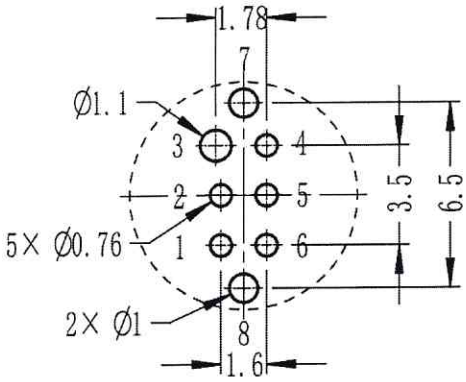


Figure 7 Recommended motherboard PCB layout design dimensions (top view)

b) Optical module Pin delay information:
The internal high-speed differential lines of the optical module has been designed with equal lengths.
The equal length of the high-speed differential pair signal lines of the user's motherboard is controlled within 5mil.

c) PCB material requirements: for products within 10G, it is recommended to choose Middle Low Loss grade materials ($0.012 \leq Df < 0.016$).

9. Precautions for use

9.1 Eye safety protection

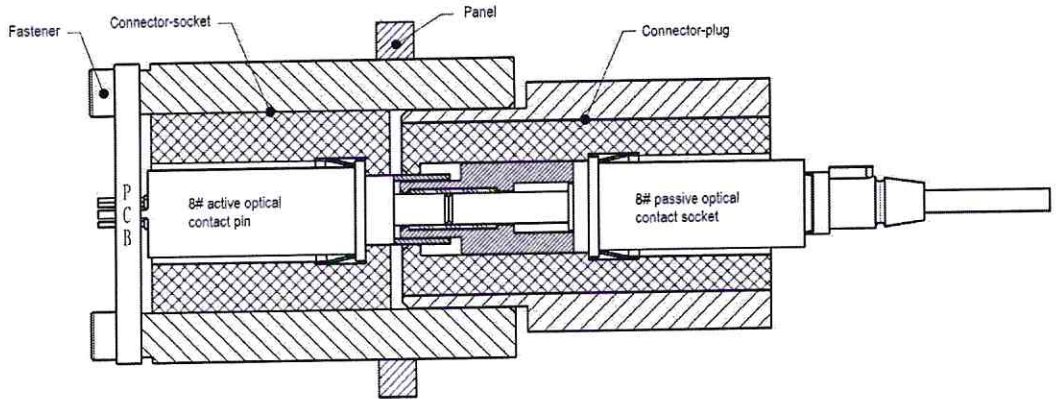
It is forbidden to look directly at the laser outlet with your eyes to prevent the laser from causing damage to the human eye; it is generally safe to observe diffuse reflection, but when observing the laser with optical instruments such as a microscope or telescope, the laser beam will cause damage to the eyes.

9.2 Preparation before installation and welding

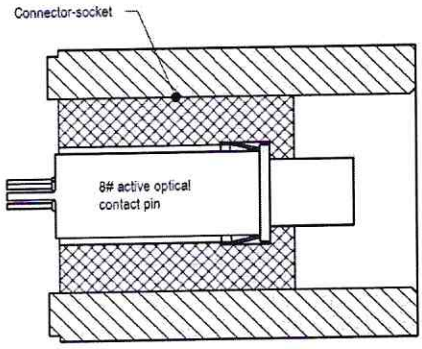
a) Module pick-up: When picking up the pigtail type single-channel optical module from the packaging box, if there is a small gasket at the rear end of the optical module, use tweezers to take out the small gasket first, and then first remove the fiber optic connector from the fixing groove. Take it out, then pick up the main body of the optical module and the connector, and take out the optical module. Pay attention to electrostatic protection when picking up, do not pull the optical module pigtail, and do not damage the pin header;
b) Before soldering, it is recommended to clean the pads and pin headers (clean with ethanol, and solder after the ethanol is completely volatilized);
c) Manual welding is adopted, and operators are required to wear anti-static wrist straps, anti-static finger cots or gloves; heating table welding, wave soldering and reflow soldering are prohibited for welding;
d) 63Sn/37Pb solder is recommended for soldering;
e) When cleaning and soldering, it is required to wear a dustproof cap/plug for the optical interface.

9.3 Module installation

a) Schematic diagram of the application of the module. The module is embedded in the connector-socket, the electrical interface is connected to the PCB, and the passive optical contact-jack (elastic contact) is embedded in the movable plug. After the plug and the socket are mated, the optical end surface of the jack contact and the optical contact of the pin contact end to face.

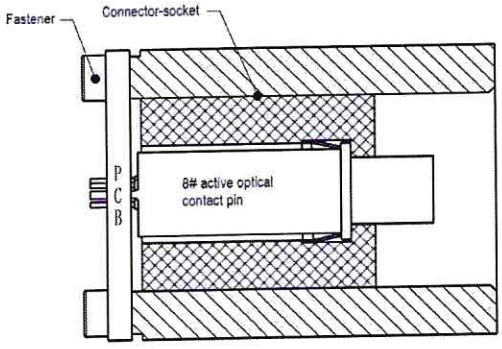


b) Insert the module into the positioning hole of the connector-socket node, and adjust the electrical interface to the correct orientation;



c) PCB installation and soldering

Correctly align the PCB with the connector-socket, so that the leads of the module are basically located in the center of the soldering holes of the PCB, and the fasteners fasten the PCB;



Insert the standard plugs in pairs, and accurately locate the position of the optical module. First, solder the 7 and 8 leads of the module, and then weld the 1-6 leads one by one.

9.4 Module welding

a) During the welding process, anti-static protection measures must be taken, such as using an anti-static soldering iron (grounding resistance less than 10 ohms); operators are required to wear anti-static wrist straps, and the environmental anti-static level has to meet the requirements of Class 1 in the S20.20 standard; 2) It is recommended to use a

pointed soldering iron to ensure good temperature and heat transfer of the soldering iron tip. It is required that the soldering temperature should be kept within 290±10°C during soldering (the soldering iron tip is in contact with the PCB pad);

b) Aerospace products can be tinned at the PCBA pad of the main board. Note: The solder at the tinned area should be as thin as possible, and the height of the solder must be the same. No tin bumps and continuous soldering are allowed, otherwise it will damage the row pins, which can easily lead to poor welding;

c) When soldering, it is required to press the module so that the pin headers of the module are in full contact with the pads on the main board to avoid false soldering;

d) The welding method recommends single-point welding. The welding time of the soldering iron touching the pad should be less than 3s each time. (If the customer uses drag welding, be sure to ensure anti-static and avoid continuous welding);

e) The number of repeated welding of the entire module does not exceed 2 times, (that is, one rework opportunity is allowed);

f) When soldering, it is forbidden to touch the tip of the soldering iron on the outer shell and pigtail;

g) Clean up after welding. It is recommended to use anti-static small brush, absorbent cotton and cleaning agent to clean the solder joints, and clean rosin, tin beads and other excess materials;

h) Post-weld inspection

1) Welding quality requirements refer to IPC-A-610 D;

2) After welding, check whether the power supply pin and the ground pin are short circuited before powering on.

9.5 Module removal

9.5.1 Preparation before disassembly

Manual disassembly is required, and the operator is required to wear an anti-static wrist strap, anti-static finger cots or gloves;

9.5.2 Disassembly operation requirements

a) During the disassembly process, take anti-static protection measures, use anti-static soldering iron tips (grounding resistance is less than 10 ohms), and the environmental anti-static level is required to be less than 100V;

b) Use a strip-shaped soldering iron tip when disassembling. The temperature of the soldering iron tip is good for heat transfer, so as to ensure that the solder of the module header can be melted at the same time;

c) Disassemble after the actual temperature of the soldering iron reaches the required temperature. It is recommended that the temperature of the soldering iron tip should be controlled between 310ºC±10ºC and the contact time should be less than 10s. When disassembling, if the amount of solder is small, it is necessary to apply an appropriate amount of solder on the contact surface between the soldering iron tip and the pin header of the module to ensure that the soldering iron tip is in full contact with the solder joints of each pin header, and at the same time, it is required that the solder should not overflow and stick to the lower surface of the module;

d) After the solder joints are melted, carefully clamp the two sides of the module with your hands and remove the module. Pay attention to the protection of the pigtail during disassembly to prevent damage to the pigtail;

e) After disassembly, clean the solder on the pin headers of the module to ensure that there is no short circuit between the pin headers and the pin headers are flat.

9.6 Three defense treatment

a) Use ethanol to clean the surface of the module, and perform subsequent operations after the ethanol is completely volatilized;
b) Protect the optical port and electrical port before applying the conformal paint. The optical port needs to wear a dust cap/plug; the method of protecting the electrical port is as follows: Use anti-solder glue to protect the pin header of the electrical port to prevent spraying, brushing problems such as poor welding after coating with conformal paint;
c) Use the brushing process to coat the surface of the module with conformal paint. It is forbidden to use the dipping process to prevent the conformal paint from polluting the inside of the module, resulting in abnormal operation of the module and making it unusable;
Note: It is recommended to use self-drying. If drying is required, the drying temperature should not be higher than the maximum storage temperature of the module.
d) After the conformal paint on the surface of the module is completely dry, remove the solder resist on the electrical port pad;

1) It is forbidden to use metal material tools to remove the solder mask on the electrical port pad;

2) If the module is welded on the user's system board and then coated with conformal paint, it is not necessary to protect the electrical port, but only to clean the surface of the module and the welded part, and the coating requirements are the same as those of a single product;

3) It is recommended to use non-volatile three-proof paint, as volatile three-proof paint can easily pollute the optical port.

9.7 Module Storage Requirements

a) The module should be stored in a dry, ventilated and non-corrosive gas environmen
-10°C ~ 40°C and relative humidity not greater than 80%;
b) Anti-static measures are required for storage, such as placing them in electrostatic foam or placing them in anti-static boxes.

9.8 Protection of modules

9.8.1 Optical interface protection requirements

a) When the optical interface protection module is not in use or during installation, the optical interface is required to wear a dust cap/plug;
b) Before the module is tested, the optical interface is required to be wiped with a dust-free cotton swab dipped in alcohol. The wiping method is as follows:
Use a clean, dust-free cotton swab dipped in an appropriate amount of alcohol, and wipe it in one direction. At the same time, it must be properly turned to the cotton swab. The number of wipes for each cotton swab should not exceed 3 times. After the alcohol is completely volatilized, it can be inserted and removed. Before plugging and unplugging, it is required to wipe the optical port connecting the jumper in the same way.
c) If the optical module needs three-proof paint protection, it is recommended to use non-volatile three-proof paint and brushing process. And it is required to do further treatment on the optical port protection before brushing, the method is as follows:
Use 3M high-temperature tape to protect the protective cap at the optical port end of the pigtail for secondary protection. Wrap the tape around the protective cap and the pigtail to form a seal.

9.8.2 Electrical interface protection requirements

a) After the module is unpacked, it is required to complete the welding within 24 hours;
b) Hard scratches are prohibited for welding the electrical interface of the module.

9.8.3 Module electrostatic protection requirements

a) The optical module is an ESD sensitive device, please pay attention to the electrostat protection of the module;
b) The turnover tool box requires a clean anti-static box turnover module, or directly uses the module packaging box for turnover;
c) When operating the module, the operator is required to wear an anti-static wrist strap a finger cots, and the wrist strap is well grounded;
d) Do not directly touch the module with bare hands.

Change record

Version	Regulation number	Previous content	Modified content	Remark
1	-	-	The new formulation	2023/04/13