

S2R-27-9D-2-X Optical SMPTE 292M/297M/259M 1310nm Video SFF 2x7 Dual Receivers -- +3.3V



Features

- SFF 2x7 Foot Print
- SMPTE 292M/297M/259M Compatible
- RoHS-6 compliant
- Handles Pathological Test Pattern
- 100Ω Differential AC Coupled CML level Outputs
- LVTTTL Signal Detect Output
- Low profile fits Mezzanine Card Applications
- Single +3.3V Power Supply
- Wave Solderable / Aqueous Washable
- Class 1 Laser Safety Compliant
- UL 1950 Approved

PRODUCT OVERVIEW

The S2R-27-9D-2-X Video Small Form Factor 2x7 (V_SFF) optical dual receiver modules are high performance integrated simplex data links for uni-directional communication over single mode optical fiber. The S2R-27-9D-2-X modules are designed to receive data rates from 143Mbps to 1.485Gbps and are compatible with the following standards:

- SMPTE 297M/292M (HDTV -- 1.485Gbps)
- SMPTE 297M/259M (SDTV -- 143/177/270/360Mbps)

The S2R-27-9D-2-X are provided with the LC receptacle which is compatible with the industry standard LC connector. The Stratos Lightwave SFF 2x7 module measure 0.532 inches in width. The S2R-27-9D-2-X operates at +3.3V.

LONG WAVELENGTH RECEIVER

The S2R-27-9D-2-X are provided with 1310nm single mode integrated PIN pre-amp subassemblies with angle polished fiber stubs.

ORDERING INFORMATION

S2R - 27 - 9D - 2 - X

GROUNDING CLIP

- N = No Clip
- E = Individual Clip (0.600" center)
- G = Gang Mount Clip (0.550" center)

RECEIVER TYPE

- 2 = Dual 1310nm PIN Receivers

PROTOCOL

- 9D = SMPTE 292M/297M/259M with Digital Diagnostics; 143 to 1485MBaud

STRATOS

optical technologies

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ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNITS	NOTES
Storage Temperature	Tstg	-40	+85	°C	Ambient
Soldering Temperature			260	°C	10 seconds on leads only
Supply Voltage	V _{CC} R		6.0	V	VCC - ground

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Operating Case Temperature	Tc	0		+70	°C	
Supply Voltage	Vcc	+3.0	+3.3	+3.6	VDC	
Baud Rate	Brate	143		1485	MBaud	143/177/270/360/1485MBaud

S2R-27-9D-2-X Optical SMPTE 292M/297M/259M 1310nm Video SFF 2x7 Dual Receivers -- +3.3V

MODULE SPECIFICATIONS - ELECTRICAL

0°<Tc<+70°C, +3.0<Vcc<+3.6V

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Supply Current	Icc		196	316	mA	Tc=+25°C; Vcc=+3.3V
				325	mA	0°C<Tc<+70°C; 3.0V<Vcc<3.6V
RECEIVER						
CML Outputs (Differential)		400	800	1200	mVpp	AC coupled outputs
Output Impedance (Differential)	Zout	90	100	110	ohms	
Total Jitter	TJ			135	ps	Measured with Color Bar Test Signal @1.485GBaud (Note 1)
				740	ps	Measured with Color Bar Test Signal @143/177/270/360MBaud
Return Loss		15			dB	Worst case @ 10KHz to 3GHz
TTL LOS Output - HIGH		Vcc-0.5		Vcc+0.3	V	Signal absent
TTL LOS Output - LOW		0		0.8	V	Signal present

Note 1: Maximum Jitter is specified for single module point-to-point applications only. In cascaded configurations, where the receiver electrical output is directly interfaced with the transmitter electrical input of a separate module, accumulated jitter may result in CRC errors to occur during pathological pattern transmission. For error-free operation in such a situation, use of re-clocker device is recommended at the output of the receiver before interfacing to the inputs of the optical transmitter. This will ensure that the output jitter will not exceed the input jitter tolerance of the succeeding transmitter input.

S2R-27-9D-2-X OPTICAL SPECIFICATIONS -- 1310nm PIN Pre-Amp

0°<Tc<+70°C, +3.0<Vcc<+3.6V

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Optical Input Wavelength	λ	1270		1610	nm	
Optical Input Power	Pr	-20		-1	dBm	Note 2,3
Optical Return Loss	ORL	29			dB	
LOS - Asserted	Pa	-29			dBm	Measured on transition - Low to High
LOS - Deasserted	Pd			-20	dBm	Measured on transition - High to Low
LOS - Hysteresis	Pa-Pd		1.5	5.0	dB	

Note 2: Minimum receiver input power is defined for line BER < 1 x 10⁻¹⁰ running PRBS 2²³ - 1 at 140/177/270/360/1485Mbps.

Note 3: In cases where optical loopback test is performed in conjunction with high power DFB laser transmitter, an external attenuation will be required to limit the receiver input power to -1dBm maximum.

S2R-27-9D-2-X Optical SMPTE 292M/297M/259M 1310nm Video SFF 2x7 Dual Receivers -- +3.3V

PHYSICAL DESCRIPTION

The S2R-27-9D-2-X features a compact design with a standard LC duplex connector for fiber optic connections. The 14-pin connector (70 mil spacing) provides the electrical connection for all operation. With a height of 9.8 mm the S2R-27-9D-2-X fits mezzanine card applications. Two wave-solderable posts are provided for attaching the package to the circuit board without the need for multiple attachment operations.

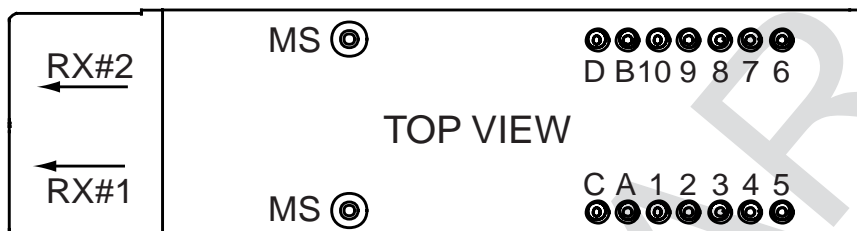


Figure 1: PIN CONFIGURATION

ELECTRICAL PIN DESCRIPTION

Pin No.	Name	Logic Level	Function
C	NC		Not internally connected
A	SCL		2-Wire Data Interface
1	-RX1	CML	Receiver #1 Data Inverted Differential Output
2	+RX1	CML	Receiver #1 Data Non-Inverted Differential Output
3	LOS1	LVTTTL	LVTTTL Receiver LOS #1 output. High on this line indicates loss of received optical signal.
4	VeeR1	CML	Receiver #1 signal/power ground
5	VccR1	CML	+3.3 volt supply for Receiver #1
6	VccR2	N/A	+3.3 volt supply for Receiver #2
7	VeeR2	N/A	Receiver #2 signal/power ground
8	LOS2	LVTTTL	LVTTTL Receiver #2LOS output. High on this line indicates loss of received optical signal.
9	+RX2	CML	Receiver #2 Data Non-Inverted Differential Output
10	-RX2	CML	Receiver #2 Data Inverted Differential Output
B	SDA		2-Wire Clock Interface
D	NC		Not internally connected
MS (Attaching Posts)			The attaching posts are provided for SFF 2x7 mechanical attachment to the PCB. They also provide an optional connection of the SFF 2x7 to the equipment chassis ground

S2R-27-9D-2-X Optical SMPTE 292M/297M/259M 1310nm Video SFF 2x7 Dual Receivers -- +3.3V

TERMINATION CIRCUITS

Outputs from the dual receiver module are CML level AC coupled and are expected to drive into a 100ohm differential load. Different termination strategies may be required depending on the particular de-serializer chip set used.

The S2R-27-9D-2-X product family is designed with AC coupled data outputs to provide the following advantages:

- Close positioning of de-serializer with respect to receiver; allows for shorter line lengths and at gigabit speeds reduces EMI.
- Minimum number of external components.
- Internal termination reduces the potential for unterminated stubs which would otherwise increase jitter and reduce transmission margin.

Subsequently, this affords the customer the ability to optimally locate the de-serializer as close to the S2R-27-9D-2-X as possible and save valuable real estate on PCI cards and other small circuit assemblies. At gigabit rates this can provide a significant advantage resulting in better transmission performance and accordingly better signal integrity. Figure 1 illustrates the recommended receive data line terminations.

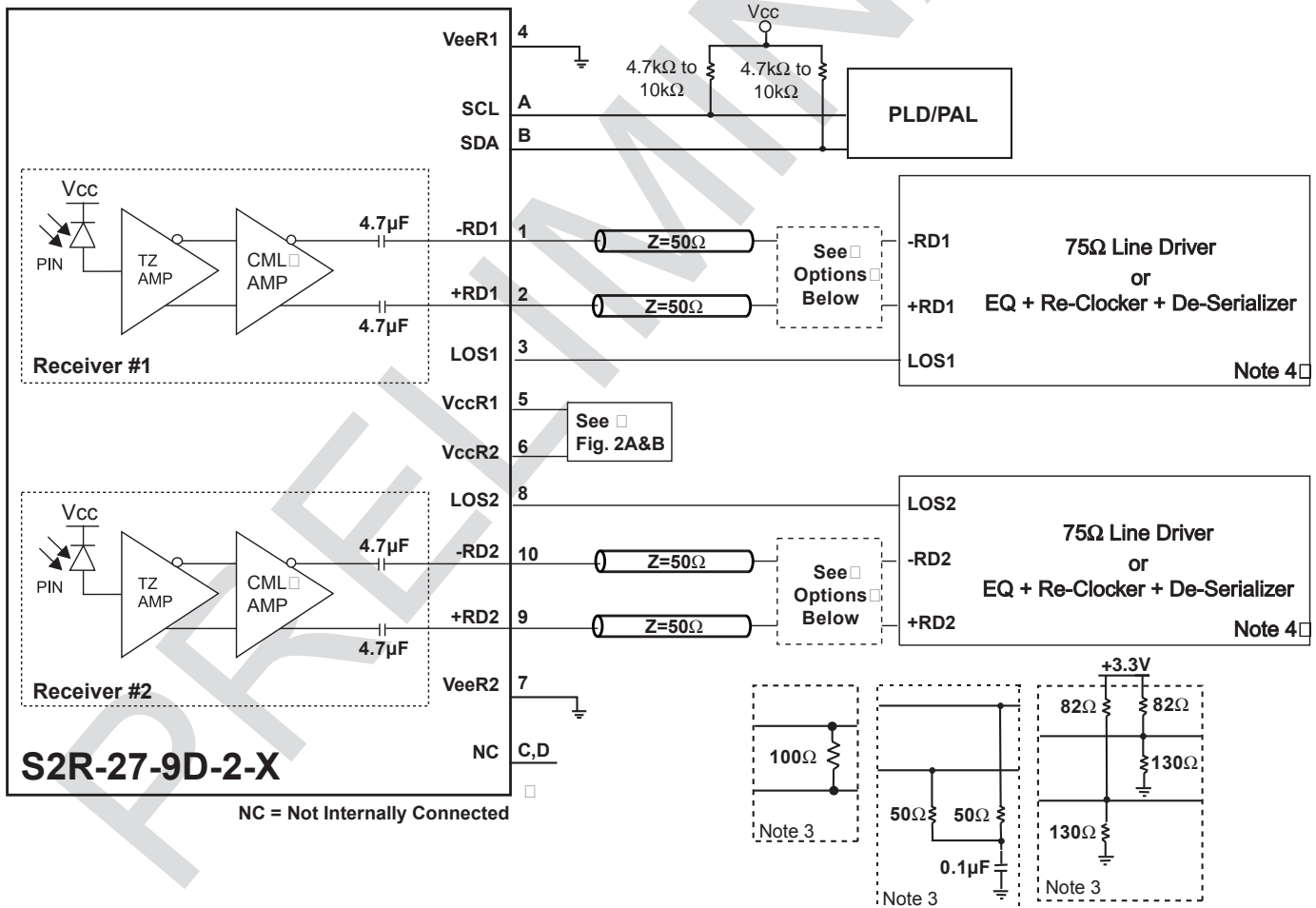


Figure 1. Recommended RECEIVE Data Terminations

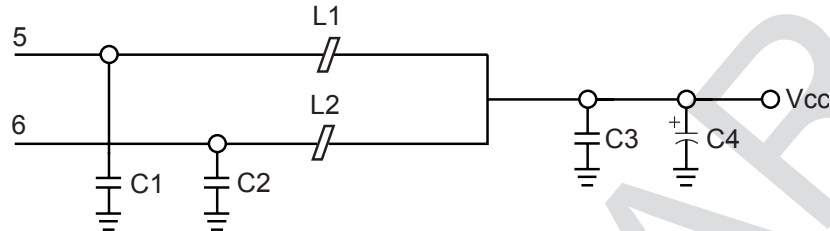
Note:

4. Consult SERDES manufacturer's data sheet and application data for appropriate receiver input biasing network.

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POWER COUPLING

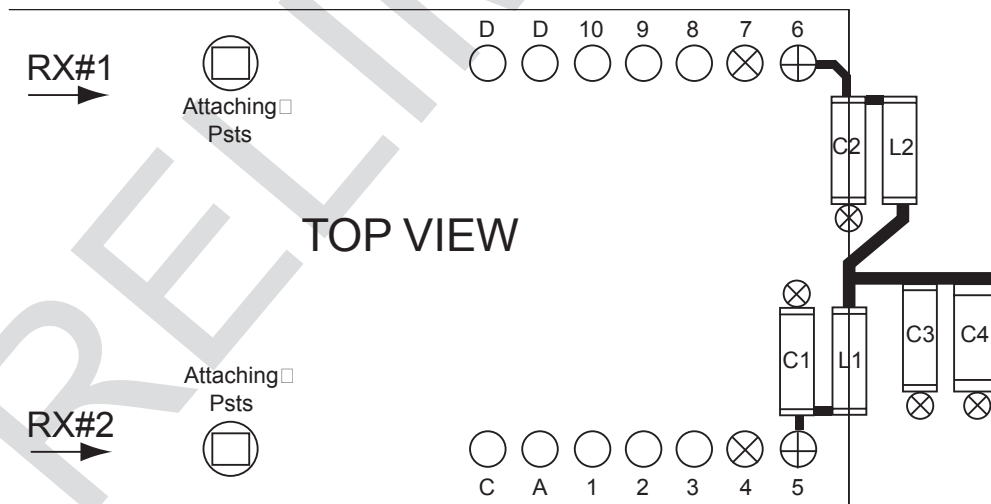
A suggested layout for power and ground connections is given in figure 2A & 2B below. Connections are made via separate voltage and ground planes. The mounting posts are at case ground and should not be connected to circuit ground. The ferrite bead should provide an impedance of 220ohms at 100MHz. Bypass capacitors should be placed as close to the 14-pin connector as possible.



Values: □

- C1, C2 = 1000pF, COG □
- C3 = 0.1μF □
- C4 = 10μF, Tantalum □
- L1, L2 = Impedance of 220Ω @ 100MHz □
- □ DC Resistance < 0.1Ω

Figure 2A. Suggested Power Coupling - Electrical Schematic



VALUES: □

- C1, C2 = 1000pF, COG □
- C3 = 0.1μF □
- C4 = 10μF, Tantalum □
- L1, L2 = Impedance of 220Ω @ 100MHz, □
- □ DC Resistance < 0.1Ω

NOTE: □ Components shown are placed □

- on the bottom layer and are □
- viewed through the board.

LEGEND:

- ⊕ Vcc Plane Connection
- ⊗ Circuit Ground Connection
- ⊞ Case Ground

Figure 2B. Suggested Power Coupling - Component Placement

S2R-27-9D-2-X Optical SMPTE 292M/297M/259M 1310nm Video SFF 2x7 Dual Receivers -- +3.3V

DIGITAL DIAGNOSTIC MONITORING INTERFACE

Stratos Lightwave SFF 2x7 dual receiver modules support the 2-wire serial communication protocol. The S2R-27-9D-2-X are provided with internally calibrated (bit 5, address 92 @ 2-wire address A0h & B0h is set) Digital Diagnostic Monitoring Interface (DDMI) which allows real-time access to device operating parameters such as module temperature, received optical power and supply voltage. It also defines a system of alarm flags, which alerts end-users when particular operating parameters are outside of a factory set normal range.

Each S2R-27-9D-2-X dual receiver modules are designed with two memory devices (one for each receiver). The contents of memory map are described in details on following pages.

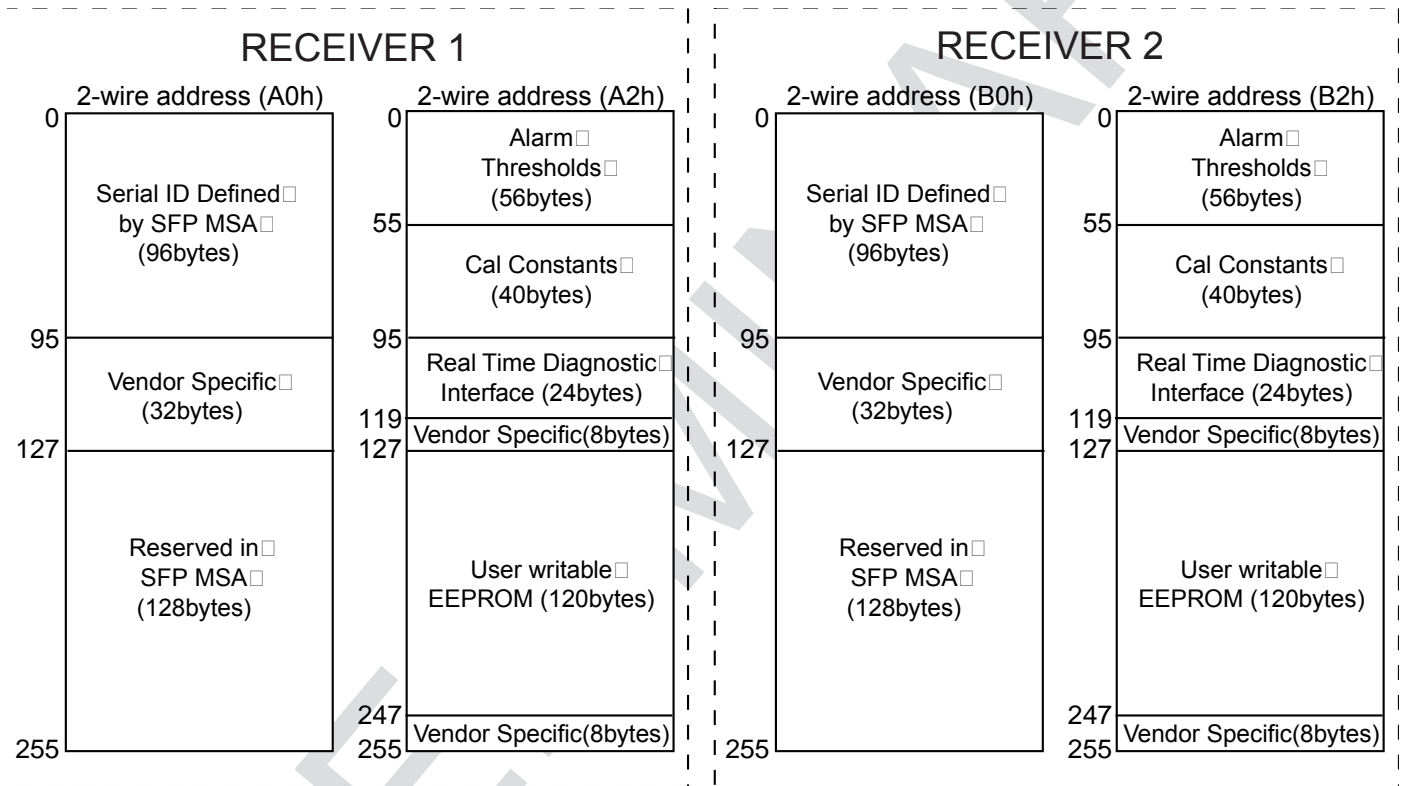


Figure 3. Digital Diagnostic Memory Map Specific Data Field Descriptions

S2R-27-9D-2-X Optical SMPTE 292M/297M/259M 1310nm Video SFF 2x7 Dual Receivers -- +3.3V

Addr. (DEC)	Hex value	ASCII	Description	Addr (DEC)	Hex value	ASCII	Description	Addr (DEC)	Hex value	ASCII	Description
0	88		Dual receiver	33	20		Vendor name	66	00		BR, Maximum
1	04		Functionality is defined by serial ID	34	20			67	00		BR, Minimum
2	07		Duplex LC	35	20			68			Vendor serial number
3	40		SMPTE 259M/292M	36	00		69				
4	00		Transceiver codes that are not applicable for SMPTE compliant modules	37	00		70				
5	00			38	00		71				
6	00			39	00		72				
7	00			40	53	S	73				
8	00			41	32	2	74				
9	00			42	52	R	75				
10	00			43	2D	-	76				
11	06		SMPTE scrambled	44	32	2	77			Reserved	
12	0F		BR in 100Mbps	45	37	7	78				
13	00		Reserved	46	2D	-	79				
14	0A		Length (9μ) * km	47	39	9	80				
15	64		Length (9μ) * 100m	48	44	D	81				
16	00		Length (50μ) * 10m	49	2D	-	82			Vendor date code	
17	00		Length (62.5μ)*10m	50	32	2	83				
18	00		Length (Copper)	51	2D	-	84				
19	00		Reserved	52	XX	X	85				
20	53	S	Vendor name	53	20		86				
21	74	t		54	20		87				
22	72	r		55	20		88				
23	61	a		56	00	0	89				
24	74	t		57	00	0	90	00		Reserved	
25	6F	o		58	00	0	91	00			
26	73	s		59	00	0	92	68		Diag. Mon. Type	
27	20			60	00		93	90		Enhanced Options	
28	20			61	00		94	01		SFF-8472 Compl.	
29	20			62	00		95	XX		CC_EXT (64-94)	
30	20		63	XX		96-127	00		Vendor specific		
31	20		64	00		128-255	00		Reserved		
32	20		65	02							

Table D.1: EEPROM SERIAL ID MEMORY CONTENTS (2-wire READ address A0h & B0h)

S2R-27-9D-2-X Optical SMPTE 292M/297M/259M 1310nm Video SFF 2x7 Dual Receivers -- +3.3V

Address (DEC)	# Bytes	Name	Description	Value
00-01	2	Temp High Alarm	MSB at low address	+100°C
02-03	2	Temp Low Alarm	MSB at low address	-50°C
04-05	2	Temp High Warning	MSB at low address	+90°C
06-07	2	Temp Low Warning	MSB at low address	-40°C
08-09	2	Supply Voltage High Alarm	MSB at low address	+3.6V
10-11	2	Supply Voltage Low Alarm	MSB at low address	+3.0V
12-13	2	Supply Voltage High Warning	MSB at low address	+3.135V
14-15	2	Supply Voltage Low Warning	MSB at low address	+3.465V
16-17	2	Bias High Alarm	Not applicable for dual receiver module	
18-19	2	Bias Low Alarm		
20-21	2	Bias High Warning		
22-23	2	Bias Low Warning		
24-25	2	Tx Power High Alarm		Not applicable for dual receiver module
26-27	2	Tx Power Low Alarm		
28-29	2	Tx Power High Warning		
30-31	2	Tx Power Low Warning		
32-33	2	Rx Power High Alarm	MSB at low address	
34-35	2	Rx Power Low Alarm	MSB at low address	-40dBm
36-37	2	Rx Power High Warning	MSB at low address	--3dBm
38-39	2	Rx Power Low Warning	MSB at low address	-30dBm
40-55	16	Reserved	Reserved for future monitored quantities	

Table D.2: ALARM AND WARNING THRESHOLDS (2-wire READ address A2h & B2h)

Address (DEC)	# Bytes	Name	Description	Value
56-59	4	Rx_PWR (4)	Single precision floating point calibration data, Rx optical Power	0
60-63	4	Rx_PWR (3)		0
64-67	4	Rx_PWR (2)		0
68-71	4	Rx_PWR (1)		1
72-75	4	Rx_PWR (0)		0
76-77	2	Tx_I (Slope)	Not applicable for dual receiver module	0
78-79	2	Tx_I (Offset)		1
80-81	2	Tx_PWR (Slope)		0
82-83	2	Tx_PWR (Offset)		1
84-85	2	T (Slope)		Fixed decimal (unsigned) calibration data, internal module temperature
86-87	2	T (Offset)	Fixed decimal (signed two's complement) calibration data, internal module temperature.	0
88-89	2	V (Slope)	Fixed decimal (unsigned) calibration data, internal module supply voltage.	1
90-91	2	V (Offset)	Fixed decimal (signed two's complement) calibration data, internal module supply voltage.	0
92-94	3	Reserved	Reserved	
95	1	Check Sum	Byte 95 contains the low order 8 bits of the sum of bytes 0 – 94.	

Table D.3: Calibration Constants for Internally Calibrated SFF 2x7 (2-wire READ address A2h & B2h)

S2R-27-9D-2-X Optical SMPTE 292M/297M/259M 1310nm Video SFF 2x7 Dual Receivers -- +3.3V

Address (DEC)	Bit	Name	Description
96	All	Temperature MSB	Internally measured module temperature
97	All	Temperature LSB	
98	All	Vcc MSB	Internally measured supply voltage in dual receiver module (Note A)
99	All	Vcc LSB	
100	All	Tx Bias MSB	Not applicable for dual receiver module
101	All	Tx Bias LSB	
102	All	Tx Power MSB	Not applicable for dual receiver module
103	All	Tx Power LSB	
104	All	Rx Power MSB	Measured RX input power (Note B)
105	All	Rx Power LSB	
106	All	Reserved MSB	Reserved for 1st future definition of digitized analog input
107	All	Reserved LSB	Reserved for 1st future definition of digitized analog input
108	All	Reserved MSB	Reserved for 2nd future definition of digitized analog input
109	All	Reserved LSB	Reserved for 2nd future definition of digitized analog input
Optional Status/Control Bits			
110	7	TX Disable state	Not applicable for dual receiver module
110	6	Soft TX Disable state	Not applicable for dual receiver module
110	5	Reserved	
110	4	Reserved	
110	3	Reserved	
110	2	Tx Fault	Not applicable for dual receiver module
110	1	LOS	Digital state of the inverted LOS (SD) output pin
110	0	Data_ready_Bar	Indicates SFF 2x7 module has achieved power up and data is ready
111	7-0	Reserved	

Table D.4: A/D Values and Status Bits (2-wire READ address A2h & B2h)

Note A: The Tx voltage VccT is monitored with accuracy of $\pm 3\%$

Note B: The accuracy of Rx optical power measurement is $\pm 3\text{dB}$

S2R-27-9D-2-X Optical SMPTE 292M/297M/259M 1310nm Video SFF 2x7 Dual Receivers -- +3.3V

Address (DEC)	Bit	Name	Description
112	7	Temp High Alarm	Set when internal temperature exceeds high alarm level
	6	Temp Low Alarm	Set when internal temperature is below low alarm level
	5	Vcc High Alarm	Set when internal supply voltage exceeds high alarm level
	4	Vcc Low Alarm	Set when internal supply voltage is below low alarm level
	3	TxBias High Alarm	Not applicable for dual receiver module
	2	TxBias Low Alarm	
	1	TxPower High Alarm	
	0	TxPower Low Alarm	
113	7	RxPower High Alarm	Set when Received power exceeds high alarm level
	6	RxPower Low Alarm	Set when Received power is below low alarm level
	5	Reserved Alarm	
	4	Reserved Alarm	
	3	Reserved Alarm	
	2	Reserved Alarm	
	1	Reserved Alarm	
	0	Reserved Alarm	
114	All	Reserved	
115	All	Reserved	
116	7	Temp High Warning	Set when internal temperature exceeds high warning level
	6	Temp Low Warning	Set when internal temperature is below low warning level
	5	Vcc High Warning	Set when internal supply voltage exceeds high warning level
	4	Vcc Low Warning	Set when internal supply voltage is below low warning level
	3	TxBias High Warning	Not applicable for dual receiver module
	2	TxBias Low Warning	
	1	TxPower High Warning	
	0	TxPower Low Warning	
117	7	RxPower High Warning	Set when Received power exceeds high warning level
	6	RxPower Low Warning	Set when Received power is below low warning level
	5	Reserved Warning	
	4	Reserved Warning	
	3	Reserved Warning	
	2	Reserved Warning	
	1	Reserved Warning	
	0	Reserved Warning	
118	All	Reserved	
119	All	Reserved	

Table D.5: Alarm and Warning Flags (2-wire READ address A2h & B2h)

Address (DEC)	# Bytes	Name	Description
120-127	8	Vendor Specific	Vendor Specific

Table D.6: Vendor Specific Memory Addresses (2-wire READ address A2h & B2h)

Address (DEC)	# Bytes	Name	Description
128-247	120	User EEPROM	User writable EEPROM
248-255	8	Vendor Specific	Vendor specific control functions

Table D.7: User EEPROM (2-wire READ address A2h & B2h)

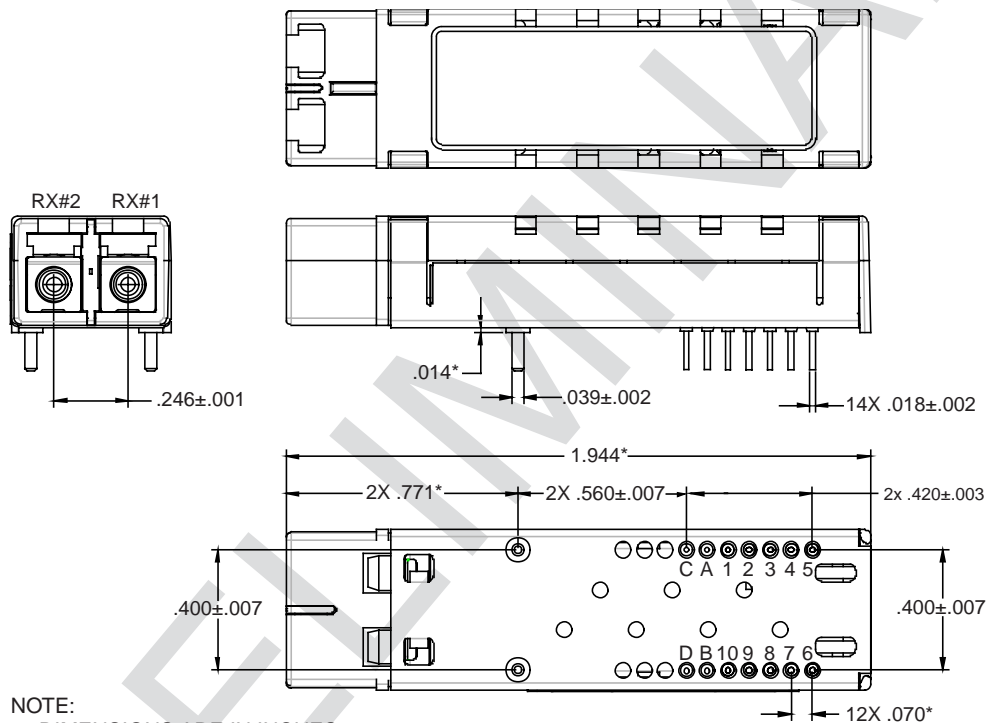
S2R-27-9D-2-X Optical SMPTE 292M/297M/259M 1310nm Video SFF 2x7 Dual Receivers -- +3.3V

EMI and ESD CONSIDERATIONS

Stratos Lightwave optoelectronic dual receiver module offer a Metal case and two types of chassis grounding clips (Individual and gang mount). As shown in the drawing, these clips connect the module case to chassis ground when installed flush through the panel cutout. The grounding clip in this way brushes the edge of the cutout in order to make a proper contact. The use of a grounding clip also provides increased electrostatic protection and helps reduce radiated emissions from the module or the host circuit board through the chassis faceplate. The attaching posts are at case potential and may be connected to chassis ground. They should not be connected to circuit ground.

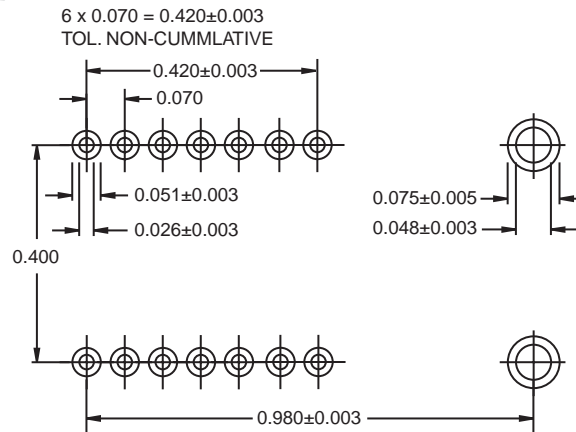
Plastic optical subassemblies are used to further reduce the possibility of radiated emissions in multimode SFF 2x7 module. By providing a non-metal receptacle for the optical cable ferrule, the gigabit speed RF electrical signal is isolated from the connector area thus preventing radiated energy leakage from these surfaces to the outside of the panel.

MECHANICAL PACKAGE DIMENSIONS (No Clip)



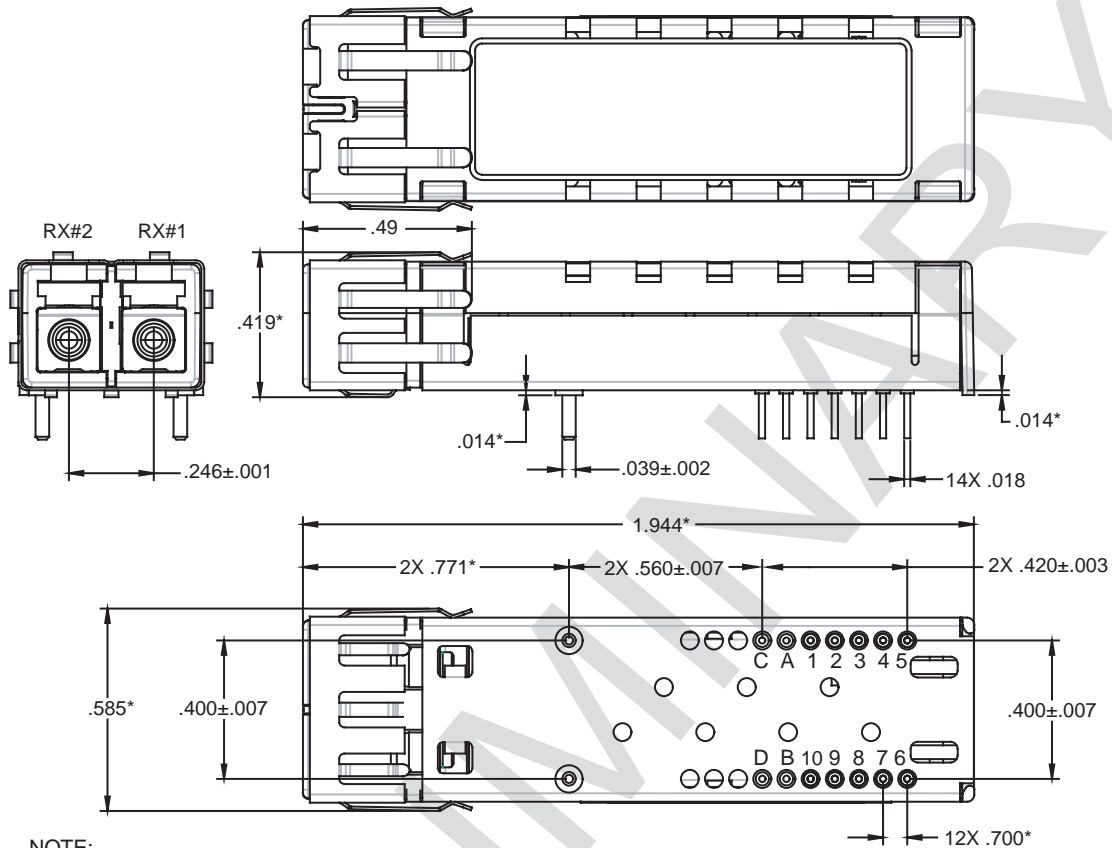
- NOTE:
 1. DIMENSIONS ARE IN INCHES
 2. * DIMENSIONS ARE FOR REFERENCE ONLY

SUGGESTED PCB LAND PATTERN



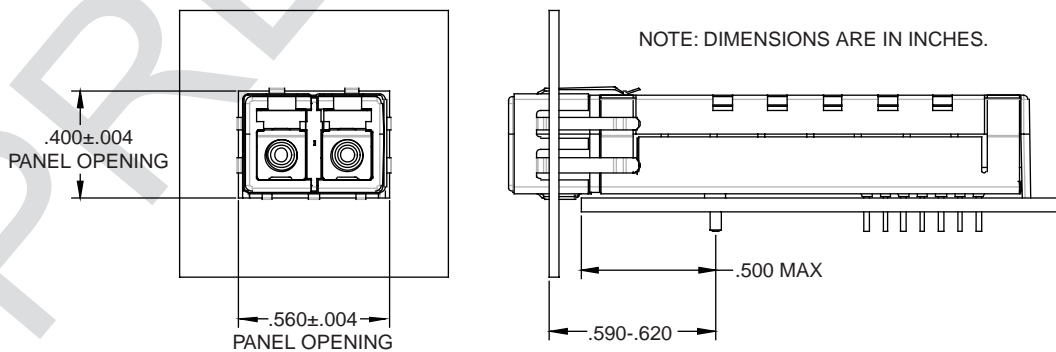
S2R-27-9D-2-X Optical SMPTE 292M/297M/259M 1310nm Video SFF 2x7 Dual Receivers -- +3.3V

MECHANICAL PACKAGE DIMENSIONS ("E" Clip)



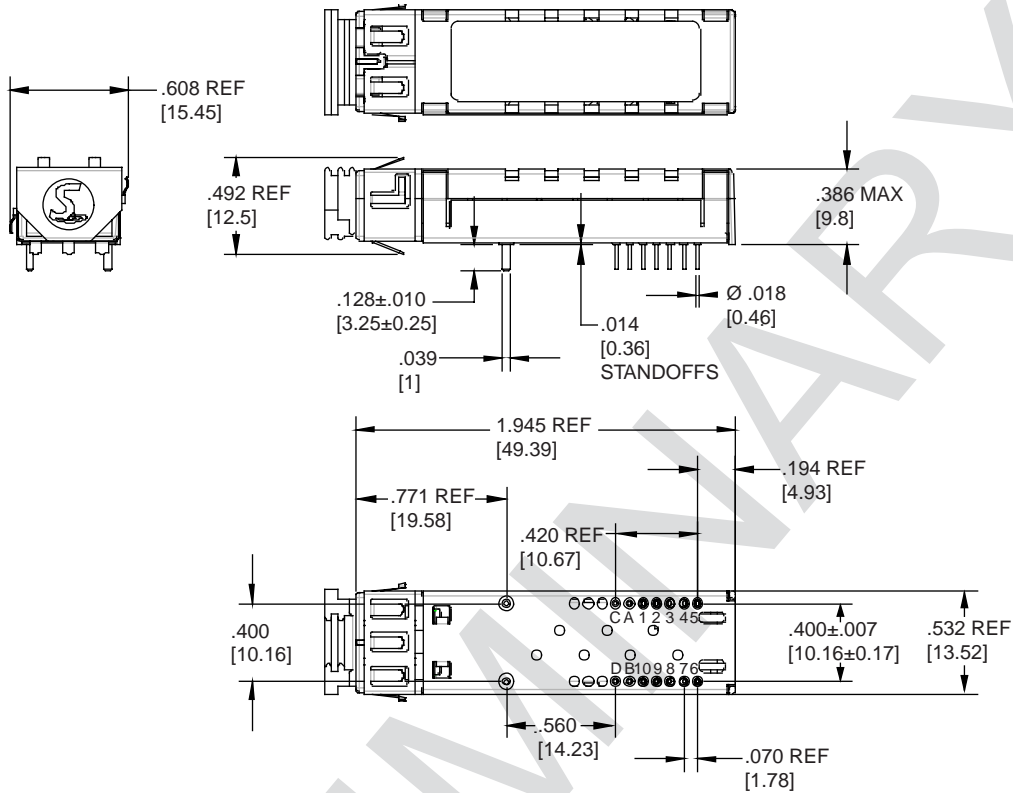
- NOTE:
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PANEL CUTOUT DIMENSIONS ("E" Clip)

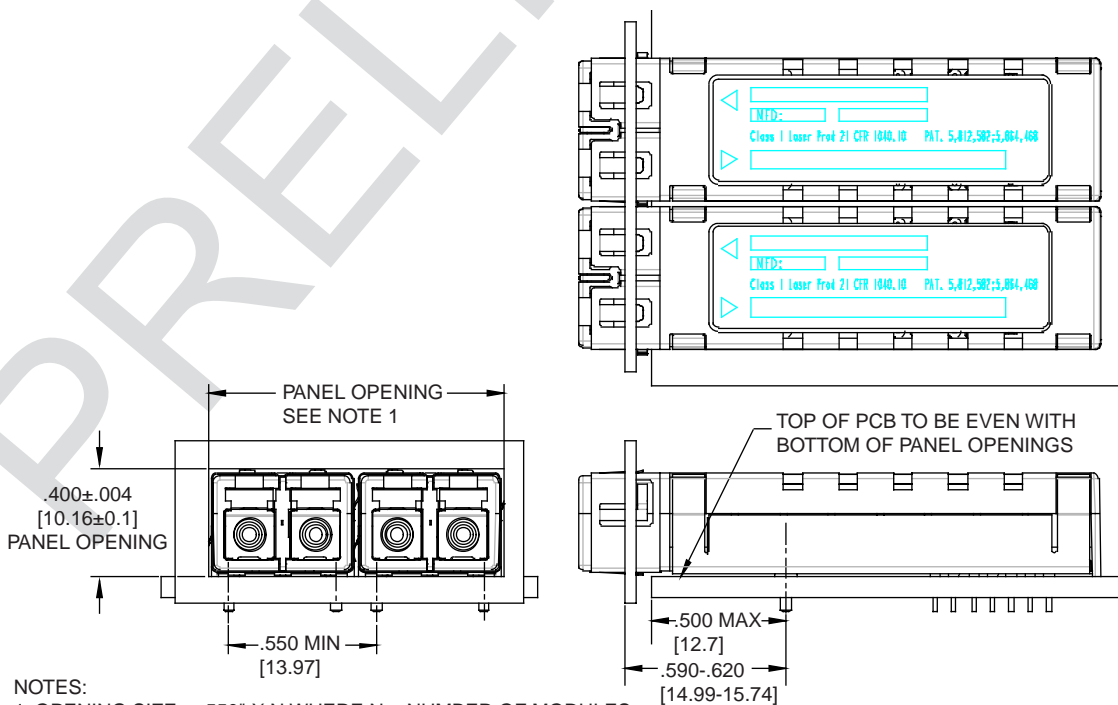


S2R-27-9D-2-X Optical SMPTE 292M/297M/259M 1310nm Video SFF 2x7 Dual Receivers -- +3.3V

MECHANICAL PACKAGE DIMENSIONS ("G" Clip)



PANEL CUTOUT DIMENSIONS ("G" Clip)



- NOTES:
 1. OPENING SIZE = .550" X N WHERE N = NUMBER OF MODULES
 2. DIMENSIONS IN in[mm]

S2R-27-9D-2-X Optical SMPTE 292M/297M/259M 1310nm Video SFF 2x7 Dual Receivers -- +3.3V

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