

P1RX6A-SX51-01M

Product Specification Sheet

ORIGINATOR:	B. Peters	DATE:	8/7/09
OMRON	P1RX6A-SX51-01M Product Specification Sheet	DOCUMENT NO. DOC000925	REV D
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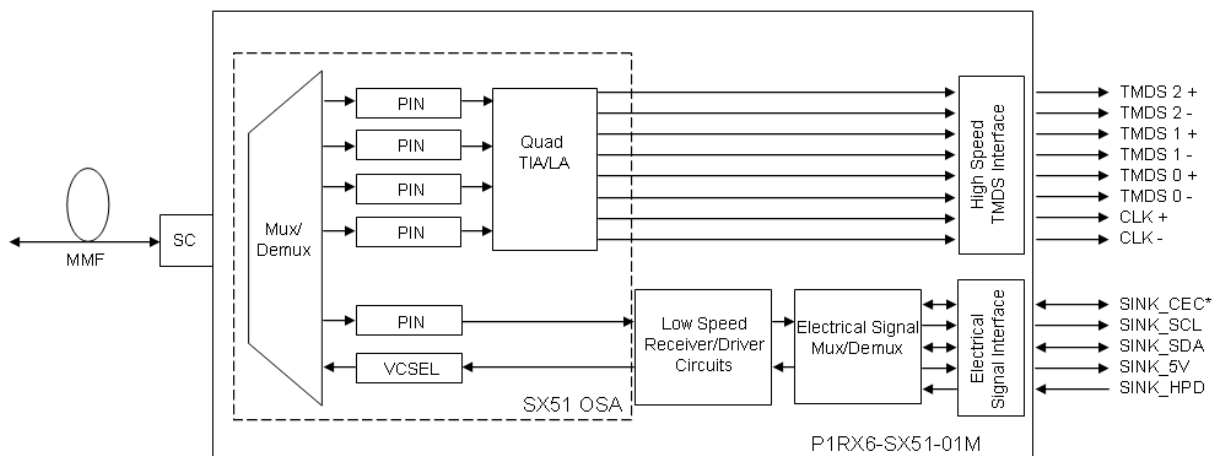
1.0 Description

The P1RX6-SX51-01M (RX-SX51) is an optical module that receives and converts an optical HDMI™ signal. The RX-SX51 incorporates a bi-directional optical subassembly (OSA) to receive an optical HDMI™ video signal, along with the HDCP/EDID/CEC functionality, from one strand of multimode fiber and restore it to its original electrical HDMI™ signal. The HDCP encoding remains intact and unmodified throughout the entire process.



2.0 Features

- 5 receive lanes and 1 transmit lane over 1 multimode fiber
- Compatible with HDMI™ compliant sources and sinks
- Scalable to HDMI™ 1.3a 16-bit color
- On-board hardware and firmware for HDCP/EDID/CEC functionality
- Outputs TMDS signals through its 40 pin plug-down connector
- Automatic laser disable upon fiber disconnect



This device is **EXTREMELY SENSITIVE** to Electrostatic Discharge (ESD). At a minimum, all handling must be performed in accordance with an ANSI-compliant ESD Control Program (ANSI/ESD S20.20-2007) to mitigate possible ESD-induced damage. Reliability and life of the device will be adversely affected if these precautions are not met.



This device is a Class 3R Laser device (per IEC 60825-1:2007) and can cause damage to eye sight if used improperly. Refer to ANSI Z136 for proper handling and usage of Class 3R devices.



HDMI, the HDMI Logo and High-Definition Multimedia Interface are trademarks or registered trademarks of HDMI Licensing LLC.

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3.0 Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Units
Storage Temperature ^{1, 3}	Tst	-40		85	°C
3.3V Supply Voltage	VCC1	-0.3		3.6	V
5.0V Supply Voltage	VCC2	-0.5		6.0	V
Operating Surface Temperature ²	Ta	0		65	°C
Operating Humidity ³	RH			80	%
Durability – SC Connector			200		cycles
Durability – Plug-down Connector			50		cycles

4.0 Optical Characteristics – High-speed Lanes

Parameter (per lane)	Symbol	Min	Typ	Max	Units
Wavelength – Lane 0			778		nm
Wavelength – Lane 1			800		nm
Wavelength – Lane 2			825		nm
Wavelength – Lane 3			850		nm
Data Rate ⁴ SX51V-01M SX51D-01M				1.65 3.50	Gb/s
Peak Optical Input Power	Pin			4.0	dBm
OMA Sensitivity ⁵		-14.25	-16.00		dBm

¹ Stresses listed may be applied without causing damage. Functionality at or above the values listed is not implied. Exposure to these values for extended periods may affect reliability.

² See outline drawing for measurement point.

³ Non condensing, 80% RH.

⁴ Requires DC-balanced data pattern. Measured with input signals conforming to HDMI™ rev 1.3a, section 4.2.5, figure 4-20.

⁵ Optical Modulation Amplitude. Based on an unstressed input signal.

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5.0 Electrical Specifications – High-speed Lanes

Parameter	Symbol	Min	Typ	Max	Units
Low Frequency Cutoff	F_{CUTOFF}		175		kHz
Total Jitter (RMS), per lane ⁶	T_{J1}		10		ps
Differential Output Voltage ⁷	V_{OD}		500		mVp-p
Operating 3.3V Supply Voltage	VCC1	3.15	3.30	3.45	V
Operating 3.3V Supply Current	ICC1			160	mA
Operating 5.0V Supply Voltage	VCC2	4.75	5	5.25	V
Operating 5.0V Supply Current	ICC2			35	mA

6.0 Optical Characteristics – Low-speed Lanes

Photodiode Parameter	Symbol	Min	Typ	Max	Units
Wavelength - Lane 4			911		nm
Data Rate			5		Mb/s
Maximum Optical Input Power	Pin			8	dBm

Laser Parameter	Symbol	Min	Typ	Max	Units
Wavelength - Lane 5			980		nm
Data Rate			5		Mb/s
Average Optical Power ⁸	Pavg		-0.5		dBm

⁶ Based on a jitter-free source

⁷ Differential back-terminated CML outputs

⁸ I= 5mA ;, T=25C.

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7.0 HDMI™ Signal Parameters

HDMI™ Signal Parameter ⁹	Symbol	Min	Typ	Max	Units
HDMI™ Input Signal – SCL _{IH} , SDA _{IH}	V _{IH}	3.5		5.75	V
HDMI™ Input Signal – SCL _{IL} , SDA _{IL}	V _{IL}	-0.5		1.5	V
Hot Plug Detect High	HPD _H	2.0		5.3	V
Hot Plug Detect Low	HPD _L	0		0.8	V
+5V Power pin Signal	V _S	4.7		5.3	V _{dc}
Sink Current for 5V Power Pin Signal	I _{sink}			55	mA
CEC ¹⁰ Output Voltage Logic '0'	V _{CEC0}	0		0.6	V
CEC Output Voltage Logic '1'	V _{CEC1}	2.5		3.63	V
High to Low Input Voltage Threshold Logic '0'	V _{CECT0}	0.0		0.8	V
Low to High Input Voltage Threshold Logic '1'	V _{CECT1}	2.0		3.63	V
CEC Rise Time (10% to 90%)	t _{CECRise}			250	μs
CEC Fall Time	t _{CECFall}			50	μs

8.0 Status Signal Functional Table¹¹

Condition					Status Signal Pin Output			
Source Cable	Source Status	Sink Cable	Sink Status	Optical Cable	SS 1	SS 2	SS 3	SS 4
X	X	X	X	D	T	0	0	0
C	ON	C	ON	C	0	0	0	0
C	OFF	C	ON	C	0	0	0	1
C	X	D	X	C	0	0	1	1
C	X	C	OFF	C	0	0	1	1
D	X	X	X	C	0	1	1	1

X Does Not Affect Outcome
 D Disconnected
 C Connected
 T Toggles Between 0 and 1 at ~ 10Hz
 0 0 Volts
 1 5 Volts

⁹ Reference I²C-Bus Specification v2 and HDMI™ rev 1.3a. Supports up to 100kHz bus speed.

¹⁰ The firmware version installed in the module must be version 2.10.06 or higher for CEC functionality. Update to version 2.10.06 or higher if the current version is not at this revision level. Refer to P1_X6-SX51-01M Bootloader Manual for updating details.

¹¹ Status signal table represents typical output. Variances in status signals may occur between different manufacturers and/or models of sources and sinks.

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9.0 Firmware¹²

The firmware utilized with the P1RX6-SX51-01M has been evaluated with the following functional tests:

- 9.1 HDCP Compliance Test (Source)
1A-01 through 1A-09, 1B-01 through 1B-06
- 9.2 HDCP Compliance Test (Sink)
2C-01 through 2C-04
- 9.3 HDCP Compliance Test (Repeater)
3C-I-01 through 3C-I-07, 3C-II-01 through 3C-II-09, 3A-01 through 3A-05, 3B-01 through 3B-05
- 9.4 EDID for HDMI™ Compliance Test (Display sink devices)
8-1, 8-2, 8-3, 8-17, 8-18, 8-19
- 9.5 CEC Compliance Tests
7-1, 7-2, 8.1, 8.2, 9.1 through 9.5, 9.7-1, 10.1.1.1-1, 10.1.2, 10.2.3, 11.1.2-2, 11.1.3-2, 11.1.6-1 through 11.1.6-4, 11.2.1-1, 11.2.2-2, 11.2.2-3, 11.2.3-2, 11.2.6-1, 11.2.6-2, 11.2.7-3 through 11.2.7-6, 11.2.7-12, 11.2.7-13, 11.2.14-1, 12-1 through 12-3

10.0 Connectivity

The P1RX6-SX51-01M will support up to eight Key Selection Vectors (KSV) allowing for up to eight HDCP compliant devices to be connected downstream from the SX51-01M link.

11.0 Laser Safety

The P1RX6-SX51-01M meets Class-3R requirements. Use proper eye protection and handling practices per ANSI Z136.

12.0 Patents

This product contains the following patents or patents pending: 6201908, 6396978, 6456757, 6558046, 6572278, 6652161.

¹² Firmware is not warranted for interoperability with all HDMI™ sources and sinks.

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13.0 ROSA Module Pin Numbers and Descriptions

The SX51 RX Module utilizes a 40 pin plug-down connector. Recommended mounting position is on the top of the board and secured in place with mounting screws located along the bottom face of the module enclosure. For information on the specifications of the connector, contact Hirose (DF12 (5.0)-40DP-0.5V).

Pin #	Name	Description
1	TMDS 2 +	Positive differential TMDS 2 signal (850nm)
2	VCC1	+3.3V Power Supply
3	GND	Ground
4	VCC1	+3.3V Power Supply
5	TMDS 2 -	Negative differential TMDS 2 signal (850nm)
6	NC ¹³	Do Not Connect
7	TMDS 1 +	Positive differential TMDS 1 signal (825nm)
8	NC	Do Not Connect
9	GND	Ground
10	NC	Do Not Connect
11	TMDS 1 -	Negative differential TMDS 1 signal (825nm)
12	NC	Do Not Connect
13	TMDS 0 +	Positive differential TMDS 0 signal (800nm)
14	SS 1	Fiber Connect Status Signal
15	GND	Ground
16	SS 2	5V Source Status Signal
17	TMDS 0 -	Negative differential TMDS 0 signal (800nm)
18	SS 3	Hot Plug Sink Status Signal
19	CLK +	Positive differential CLK signal (778nm)
20	SS 4	Video Detect Status Signal

¹³ NC = Do not connect this pin

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ROSA Module Pin Numbers and Descriptions (Cont'd)

Pin #	Name	Description
21	GND	Ground
22	Reserved	Reserved for Omron future use – Do Not Connect
23	CLK -	Negative differential CLK signal (778nm)
24	NC	Do Not Connect
25	SINK_CEC	Sink CEC ¹⁴
26	NC	Do Not Connect
27	NC	Do Not Connect
28	NC	Do Not Connect
29	SINK_SCL	Sink Clock ¹⁵
30	NC	Do Not Connect
31	SINK_SDA	Sink Data
32	NC	Do Not Connect
33	GND	Ground
34	Reset	Module Reset ¹⁶ (Must be asserted to +5V for normal operation)
35	SINK_5V	Sink 5V signal ¹⁷
36	VCC2	+5V Power Supply
37	SINK_HPD	Sink Hot Plug Detect signal
38	VCC2	+5V Power Supply
39	GND	Ground
40	GND	Ground

¹⁴ Internal 27.4kΩ pull-up to 3.3v

¹⁵ Internal 2kΩ pull-up to 5v

¹⁶ See Information Package for Mechanical Reset Circuit

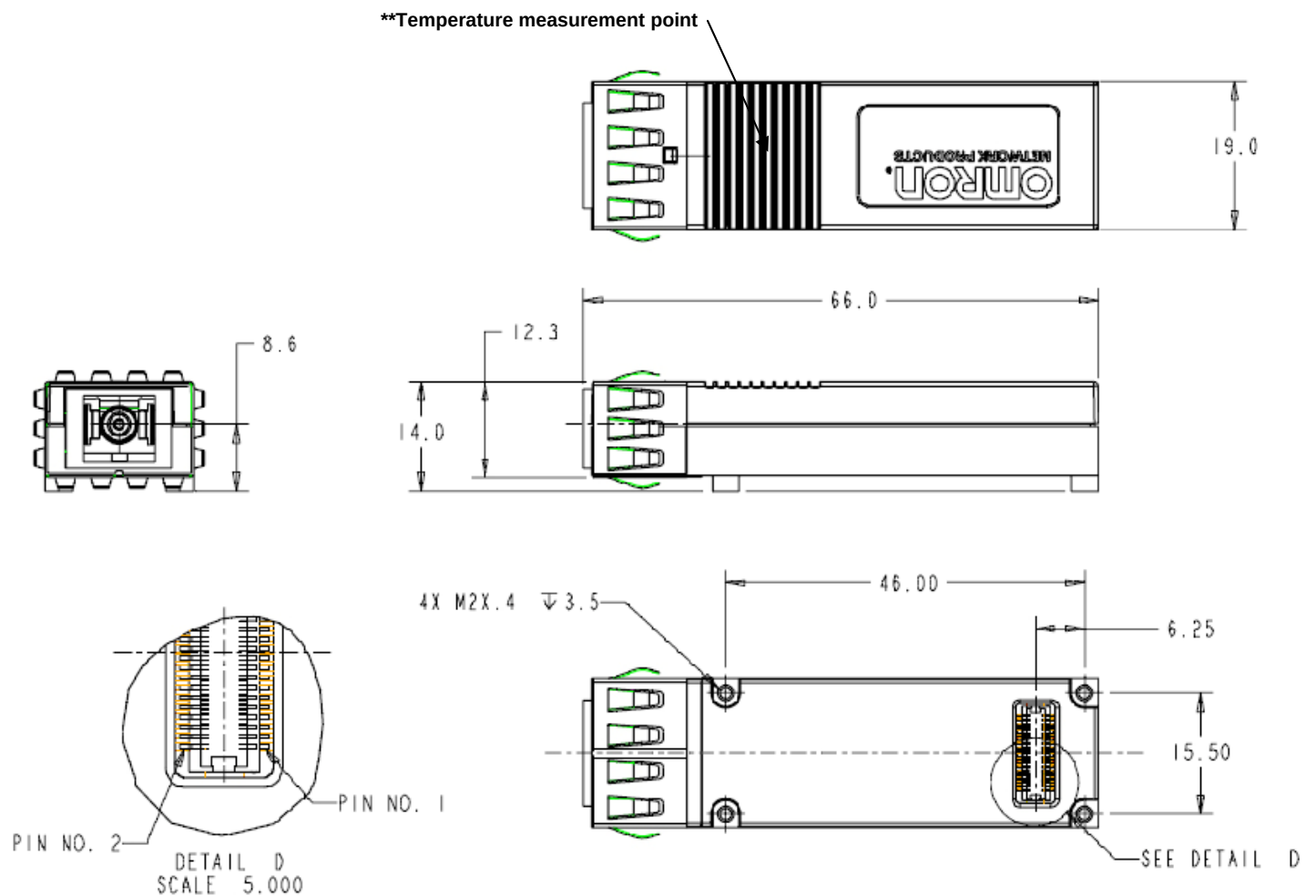
¹⁷ Internal 10kΩ pull-down to ground

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14.0 Dimensions

The SX51 RX Module is designed to work with a standard SC ferrule only. Insertion of any other type may result in damage. For dust cap information, contact L-Com (DSTCP-SC).

Dimensions and orientation are for reference only.



All dimensions are in mm.

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