

P1RX6A-SX51-01M

Product Specification Sheet

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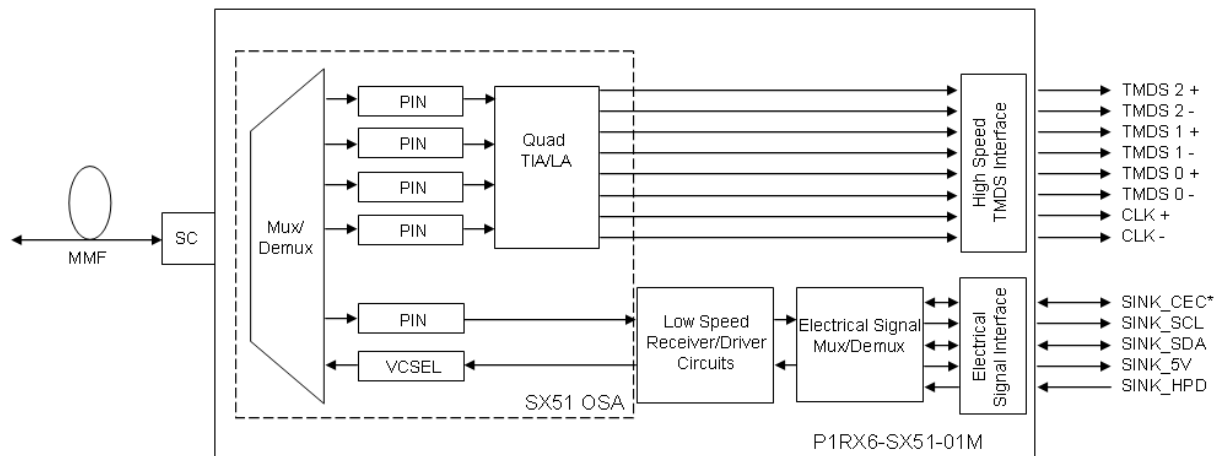
1.0 Description

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.



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CONFIDENTIAL INFORMATION

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 | P _{avg} | | -0.5 | | dBm |

⁶ Based on a jitter-free source

⁷ Differential back-terminated CML outputs

⁸ I = 5mA ; T = 25°C.

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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 | Vdc |
| 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

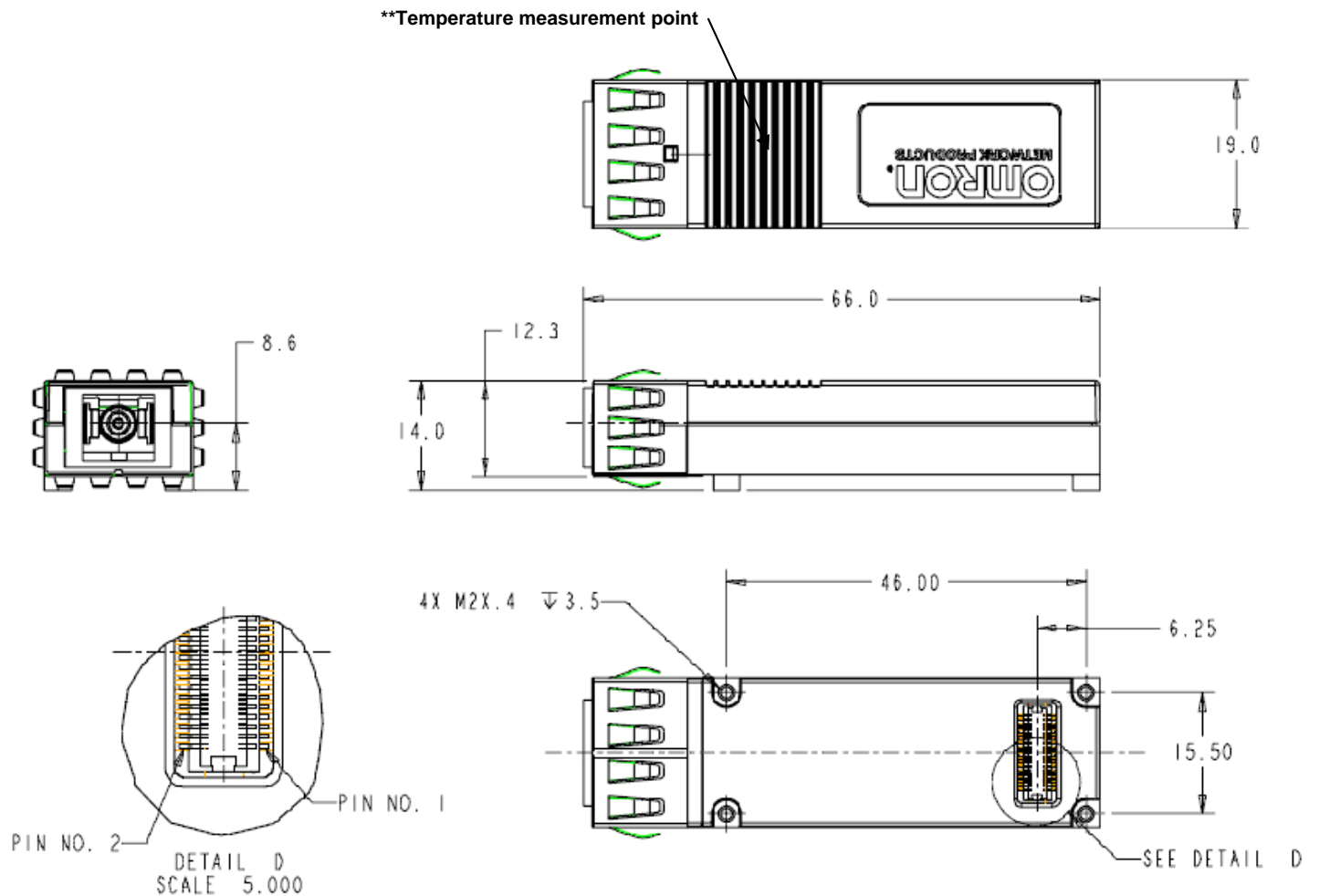
¹⁷ Internal 10kΩ pull-down to ground

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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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