

# P1TX6A-SX51-01M

## Product Specification Sheet

ORIGINATOR:	B. Peters	DATE:	8/7/09
<b>OMRON</b>	P1TX6A-SX51-01M Product Specification Sheet	DOCUMENT NO. DOC000924	D
		SHEET 1 OF 10	

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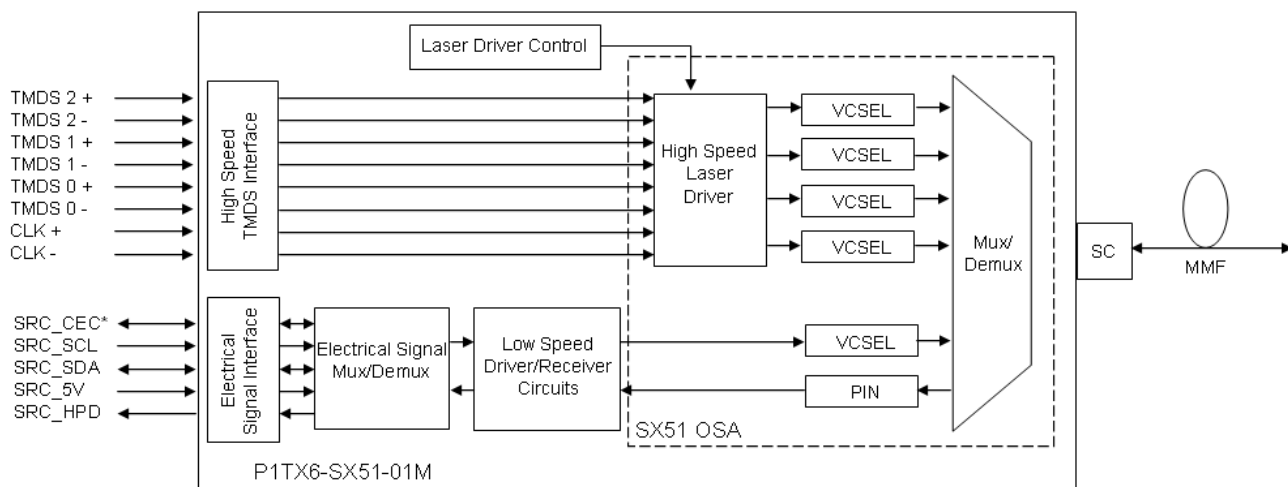
## 1.0 Description

The P1TX6-SX51-01M (TX-SX51) is an optical module that transmits an HDMI™ signal on one strand of multimode fiber. The TX-SX51 incorporates a bi-directional optical subassembly (OSA) to convert and transmit an uncompressed electrical HDMI™ video signal, along with the HDCP/EDID/CEC functionality, over distances of up to 1000m.



## 2.0 Features

- 5 transmit lanes and 1 receive 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
- Accepts TMDS inputs directly into 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.

ORIGINATOR:		B. Peters		DATE:		8/7/09	
omron	P1TX6A-SX51-01M Product Specification Sheet			DOCUMENT NO. DOC000924		D	
				SHEET 2 OF 10			

CONFIDENTIAL INFORMATION

### 3.0 Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Units
Storage Temperature <sup>1,3</sup>	Tst	-40		85	°C
3.3V Supply Voltage	VCC1	-0.3		3.6	V
5.0V Supply Voltage	VCC2	-0.5		6	V
Operating Surface Temperature <sup>2</sup>	Ta	0		65	°C
Operating Humidity <sup>3</sup>	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
Average Optical Power, per Lane <sup>4</sup>	Pout	-3.0	0.0		dBm
Optical Modulation Amplitude		-6.25			dBm
Center Wavelength – Lane 0			778		nm
Center Wavelength – Lane 1			800		nm
Center Wavelength – Lane 2			825		nm
Center Wavelength – Lane 3			850		nm

<sup>1</sup> 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.

<sup>2</sup> See outline drawing for measurement point.

<sup>3</sup> Non condensing, 80% RH.

<sup>4</sup> I= 5mA, T=25C.

<b>ORIGINATOR:</b>		<b>B. Peters</b>	<b>DATE:</b>		<b>8/7/09</b>
	<b>P1TX6A-SX51-01M Product Specification Sheet</b>		<b>DOCUMENT NO.</b> <b>DOC000924</b>		<b>D</b>
			<b>SHEET 3 OF 10</b>		

## 5.0 Electrical Specifications – High-speed Lanes

Parameter	Symbol	Min	Typ	Max	Units
Data Rate per Lane <sup>5</sup> P1TX6-SX51V-01M P1TX6-SX51D-01M				1.65 3.50	Gb/s
Total Jitter (RMS), per lane <sup>6</sup>	T <sub>J1</sub>		10		ps
Input Differential Impedance			100		ohm
Differential Input Voltage <sup>7</sup>		320		2000	mVp-p
Single-ended Input Voltage		160		1000	mVp-p
Common mode input voltage (AC-coupled input)		0.85	2.6	VCC	V V
Operating 3.3V Supply Voltage	VCC1	3.15	3.30	3.45	V
Operating 3.3V Supply Current	ICC1			235	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

Laser Parameter	Symbol	Min	Typ	Max	Units
Wavelength - Lane 4			911		nm
Data Rate			5		Mb/s
Average Optical Power	P <sub>avg</sub>		-0.5		dBm

Photodiode Parameter	Symbol	Min	Typ	Max	Units
Wavelength - Lane 5			980		nm
Data Rate			5		Mb/s
Maximum Optical Input Power	P <sub>in</sub>			8	dBm

<sup>5</sup> Measured with input signals conforming to HDMI™ rev 1.3a, section 4.2.4, figure 4-18.

<sup>6</sup> Based on a jitter-free source

<sup>7</sup> Differential CML compatible inputs

Differential CME comparison inputs					
ORIGINATOR:		B. Peters	DATE:	8/7/09	
OMRON	P1TX6A-SX51-01M Product Specification Sheet		DOCUMENT NO. DOC000924		D
			SHEET 4 OF 10		

## 7.0 HDMI™ Signal Parameters

HDMI™ Signal Parameter <sup>8</sup>	Symbol	Min	Typ	Max	Units
HDMI™ Input Signal – SCL <sub>IH</sub> , SDA <sub>IH</sub>	V <sub>IH</sub>	3.5		5.75	V
HDMI™ Input Signal – SCL <sub>IL</sub> , SDA <sub>IL</sub>	V <sub>IL</sub>	-0.5		1.5	V
Hot Plug Detect High	HPD <sub>H</sub>	2.4		5.3	V
Hot Plug Detect Low	HPD <sub>L</sub>	0		0.4	V
CEC <sup>9</sup> Output Voltage Logic '0'	V <sub>CEC0</sub>	0		0.6	V
CEC Output Voltage Logic '1'	V <sub>CEC1</sub>	2.5		3.63	V
High to Low Input Voltage Threshold Logic '0'	V <sub>CECT0</sub>	0.0		0.8	V
Low to High Input Voltage Threshold Logic '1'	V <sub>CECT1</sub>	2.0		3.63	V
CEC Rise Time (10% to 90%)	t <sub>CECRise</sub>			250	μs
CEC Fall Time	t <sub>CECFall</sub>			50	μs

## 8.0 Status Signal Functional Table<sup>10</sup>


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 Output  
 D Disconnected  
 C Connected  
 T Toggles Between 0 and 1 at ~ 10Hz  
 0 0 Volts  
 1 5 Volts

<sup>8</sup> Reference I<sup>2</sup>C-Bus Specification v2 and HDMI™ rev 1.3a. Supports up to 100kHz bus speed.

<sup>9</sup> 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.

<sup>10</sup> Status signal table represents typical output. Variances in status signals may occur between different manufacturers and/or models of sources and sinks.

ORIGINATOR:				B. Peters		DATE:		8/7/09	
	P1TX6A-SX51-01M Product Specification Sheet				DOCUMENT NO. DOC000924		D		
					SHEET 5 OF 10				

## 9.0 Fiber Transmission Distance

Data Rate	Skew Limit	OM1 (160 MHz*km)	OM2 (500 MHz*km)	OM3 (1000 MHz*km)	Units
1.65 Gbps	None	200	400	1000	m
	2.42ns	200	400	400	m
3.50 Gbps	None	100	200	500	m
	2.42ns	100	200	400	m

## 10.0 Laser Safety

The P1TX6-SX51-01 meets Class-3R requirements. Use proper eye protection and handling practices per ANSI Z136.

## 11.0 Firmware<sup>11</sup>

The firmware utilized with the P1TX6-SX51-01M has been evaluated through the following functional tests:

### 11.1 HDCP Compliance Test (Source)

1A-01 through 1A-09, 1B-01 through 1B-06

### 11.2 HDCP Compliance Test (Sink)

2C-01 through 2C-04

### 11.3 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

### 11.4 EDID for HDMI™ Compliance Test (Display sink devices)

8-1, 8-2, 8-3, 8-17, 8-18, 8-19


### 11.5 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

## 12.0 Connectivity

The P1TX6-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.

<sup>11</sup> Firmware is not warranted for interoperability with all HDMI™ sources and sinks.

<b>ORIGINATOR:</b>		<b>B. Peters</b>	<b>DATE:</b>	<b>8/7/09</b>
	<b>P1TX6A-SX51-01M Product Specification Sheet</b>		<b>DOCUMENT NO.</b> <b>DOC000924</b>	<b>D</b>
			<b>SHEET 6 OF 10</b>	



### 13.0 Patents

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


ORIGINATOR:	B. Peters	DATE:	8/7/09
OMRON	P1TX6A-SX51-01M Product Specification Sheet	DOCUMENT NO. DOC000924	D
		SHEET 7 OF 10	

CONFIDENTIAL INFORMATION

## 14.0 TOSA Module Pin Numbers and Descriptions

The SX51 TX 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	Reserved	Reserved for Omron future use – Do Not Connect
7	TMDS 1 +	Positive differential TMDS 1 signal (825nm)
8	Reserved	Reserved for Omron future use – Do Not Connect
9	GND	Ground
10	Reserved	Reserved for Omron future use – Do Not Connect
11	TMDS 1 -	Negative differential TMDS 1 signal (825nm)
12	Reserved	Reserved for Omron future use – 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

ORIGINATOR:		B. Peters		DATE:		8/7/09	
	P1TX6A-SX51-01M Product Specification Sheet			DOCUMENT NO. DOC000924		D	
				SHEET 8 OF 10			

CONFIDENTIAL INFORMATION



## TOSA Module Pin Numbers and Descriptions (Cont'd)

Pin #	Name	Description
21	GND	Ground
22	NC <sup>12</sup>	Do Not Connect
23	CLK -	Negative differential CLK signal (778nm)
24	NC	Do Not Connect
25	SRC_CEC	Source CEC <sup>13</sup>
26	NC	Do Not Connect
27	NC	Do Not Connect
28	Reserved	Reserved for Omron future use
29	SRC_SCL	Source Clock <sup>14</sup>
30	NC	Do Not Connect
31	SRC_SDA	Source Data
32	NC	Do Not Connect
33	GND	Ground
34	Reset	Module Reset <sup>14</sup> (Must be asserted to +5V for normal operation)
35	SRC_5V	Source 5V signal <sup>15</sup>
36	VCC2	+5V Power Supply
37	SRC_HPD	Source Hot Plug Detect signal
38	VCC2	+5V Power Supply
39	GND	Ground
40	GND	Ground

<sup>12</sup> NC = Do not connect this pin

<sup>13</sup> Internal 27.4kΩ pull-up to 3.3v

<sup>14</sup> Internal 47kΩ pull-up to 5v

<sup>14</sup> See Information Package for Mechanical Reset Circuit

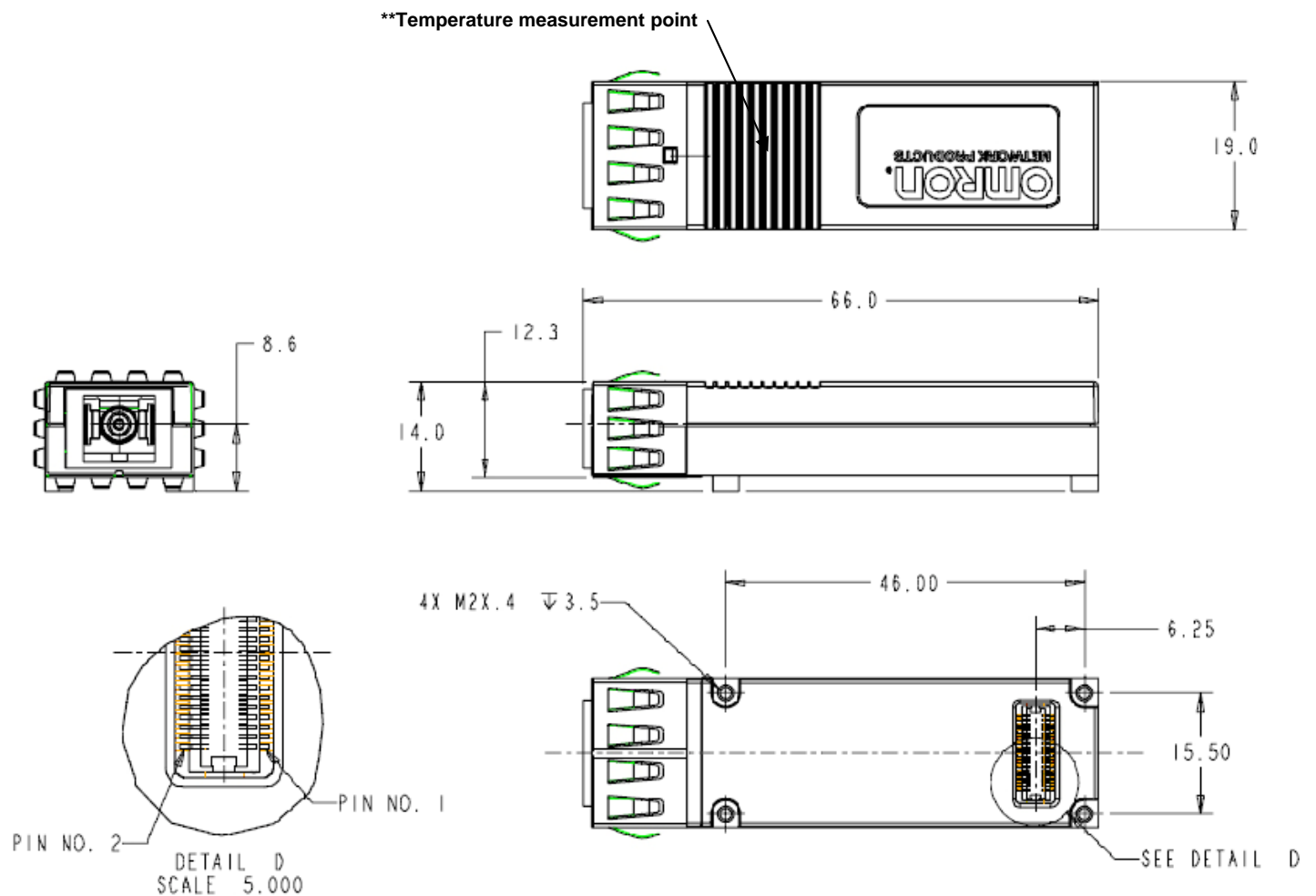
<sup>15</sup> Internal 10kΩ pull-down to ground

Internal 10kΩ pull down to ground				
ORIGINATOR:		B. Peters	DATE:	8/7/09
OMRON	P1TX6A-SX51-01M Product Specification Sheet		DOCUMENT NO. DOC000924	D
			SHEET 9 OF 10	

## 15.0 Dimensions

The SX51 TX 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.

ORIGINATOR:		B. Peters		DATE:		8/7/09	
OMRON	P1TX6A-SX51-01M Product Specification Sheet			DOCUMENT NO. DOC000924		D	
				SHEET 10 OF 10			

CONFIDENTIAL INFORMATION