M1-201SA-TR (Ver. 1.4)



# **DATA SHEET**

# **Optical Graphic Extension Module-Fibres Detachable**

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# **Optical Graphic Extension Module**

- Fibres Detachable -

# Description

Optical graphic extension module consists of transmitter module and receiver module, each of which has 4 LC connectors and a 20-pins DVI–D plug. Users could decide extension length at their discretion by choosing the length of fibre-optic cables with LC ferrules at the ends. It offers graphic TMDS signals to be extensible up to the limits of modal bandwidth of selected multi-mode glass fibers, or, 50/125 um or 62.5/125um.

A transmitter, 4 VCSEL array inside and a receiver, 4 Pin-PDs array inside has a capability to transmit WUXGA (1920X1200) graphic signals with 60Hz refresh rate. At such data bandwidth, this module can extend up to 1,640 feet (500 meters) much over the limits of copper wire extension, without any distribution amplifier or repeater.

The EDID in a display can be read and restored by just plugging it to the display. This self-EDID programming feature makes the installation of M1-201SA more easy and flexile at any variable resolution display systems.

The modules are constituted of three parts as follows;

- One transmitter converting electrical to optical signals, model name: M1-201SA-T
- One receiver converting optical to electrical signals, model name: M1-201SA-R
- Two AC Adaptors to 110V-240V with DC 5V 1A outlet

## Features

- Extends all VESA resolution up to WUXGA (1920 X 1200) 60Hz DVI data up to 500 meters (1,640 feet)
- Detachable feature with a pair of duplex LC **multi-mode** fibers
- Offers self-EDID programming feature, detecting from a display and restoring to an EEPROM in the transmitter just by plugging to the display without any physical DDC connection
- The modules are compact enough to directly plug to graphic sources and displays by adopting DVIplugs
- Includes two (2) +5V DC power adapters for the transmitter and receiver
- Complies with Class 1 Laser eye safety in compliance with FDA/CDRH and IEC 60825-1
- Data security with negligible RFI/EMI emissions and loss of video quality due to no copper conductor present
- Certifications: UL/EN 60601-1, 60601-1-2:1994, CE / FCC, Class 1 Laser Eye Safety





### **Applications**

- Digital FPDs, PDPs and projectors for medical appliances, aero, traffic control, factory, and bank
- Digital FPDs and projectors in conference room and auditorium
- Kiosk with digital FPDs showing full motion graphic displays from remote systems
- PDP displays for information in public sites
- LED signboards in streets and in stadium

# **Technical Specifications**

#### - General Specifications

	Parameter	Specifications
	Lasor Diodos in Tx Modulo	850nm Multi-mode VCSEL (Vertical Cavity
Components		Surface Emitting Laser)
	Photo Diodes in Rx Module	GaAs PIN-PD
	Input and Output Signals	TMDS Level (complying with DVI1.0)
Electrical	Data Transfer Rate (Graphic Data)	Max. 1.65Gbps
Electrical	Total Jitter at the end of Rx output	Max. 309 ps
	Skew inter-channels	Max. 6ns
Optical	Link Power Budget	Min 10.5dB
Mechanical	Module dimension (mm)	38WX19HX72L
	Optical Connector	2 Duplex LC connectors
Connect	Electric Connector Type from Systems	24 pip DV/LD plug
	and to Displays	24 pin DVI-D plug
	Recommended Fiber	50/125 um Multi-mode Glass Fiber

#### - Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Supply Voltage	V <sub>CC</sub>	- 0.3	+ 6.0	V
Operating Temperature	T <sub>op</sub>	0	50	°C
Storage Temperature	Ts	- 30	+ 70	°C
Storage Relative Humidity	Hs	10	95	%RH



#### **Operating Conditions** Transmitter module (E-to-O converter): M1-201SA-T

	Parameter	Symbol	Minimum	Typical	Maximum	Units
	Supply Voltage	Vcc	4.5	5.0	5.5	V
Ωр	Supply Current	I <sub>TCC</sub>	130	160	200	mA
ddr	Power Dissipation	P <sub>TX</sub>	0.585	0.8	1.045	W
er ly	Power Supply Rejection (Note1)	PSR		50		$mV_{p\text{-}p}$
	Data Output Load	R <sub>LD</sub>		50		Ω
	Graphic Supply Voltage (Note2)	GV <sub>CC</sub>	+ 3.1	+ 3.3	+ 3.5	V
TMDS	Single-Ended High Level Input Voltage	GVIH	GV <sub>CC</sub> - 0.01	GV <sub>CC</sub>	GV <sub>CC</sub> + 0.01	V
	Single-Ended Low Level Input Voltage	GVIL	GV <sub>CC</sub> - 0.6	-	GV <sub>CC</sub> - 0.4	V
	Single-Ended Input Swing Voltage	GVISWING	0.4	-	0.6	V
	Output Optical Power	Po	-9.5		-3.6	dBm
0	Wavelength	λ	830	850	860	nm
(2 ti	Spectral width in RMS	Δλ			0.85	nm
cal Lii lote3)	Relative Intensity of Noise RIN (Note4)			-117		dB/Hz
بر ب	Rising/Falling Time	T <sub>rise</sub> /T <sub>fall</sub>			260	ps
	Jitter in p-p value (Note5)	T <sub>jitter</sub>			270	ps

Note1. Tested with a 50mV<sub>p-p</sub> sinusoidal signal in the frequency range from 500 Hz to 500 MHz on the V<sub>CC</sub> supply with the recommended power supply filter in place. Typically less than a 0.25 dB change in sensitivity is experienced.
Note2. Graphic Supply Voltage is regulated reference voltage for signal processing in modules
Note3. Measure signals at the end of 2 meter 50/125um MMGOF

Note4. Measure in 1GHz of frequency bandwidth Note5. Use PPG (Pulse Pattern Generator) source with jitter 50ps

#### Receiver module (O-to-E converter): M1-201SA-R

	Parameter	Symbol	Minimum	Typical	Maximum	Units
	Supply Voltage	Vcc	4.5	5.0	5.5	V
SCP	Supply Current	I <sub>RCC</sub>	350	360	380	mA
ddr	Power Dissipation	P <sub>RX</sub>	1.575	1.8	2.09	W
er oly	Power Supply Rejection (Note6)	PSR		50		$mV_{p\text{-}p}$
	Data Input Load	R <sub>LD</sub>		50		Ω
TMDS	Graphic Supply Voltage (Note7)	GV <sub>CC</sub>	+ 3.1	+ 3.3	+ 3.5	V
	Single-Ended Output Swing Voltage (Note8)	GVISWING	0.2	-	0.4	V
	Receiving Optical Power		-20		-3.6	dBm
0	Receiving Wavelength		830	850	860	nm
⇒ g Signal_Detect Good		SDg			-17	dBm
lot	Signal_Detect Fail	SDf	-25			dBm
l Lin⊧ e9)	Link Power Budget	P <sub>bgt</sub>	10.5			dB
	Total Jitter (note 10)	TR <sub>jitter</sub>			309	ps

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Note6. Tested with a  $50mV_{p-p}$  sinusoidal signal in the frequency range from 500 Hz to 500 MHz on the V<sub>CC</sub> supply with

the recommended power supply filter in place. Typically less than a 0.25 dB change in sensitivity is experienced.

Note7. Graphic Supply Voltage is regulated reference voltage for signal processing in modules

Note8. TMDS outputs are coupled in AC

Note9. Measure signals at the end of 2 meter 50/125um MMGOF

Note10. It is measured as total jitters including Tx and Rx modules under maximum extension, 500 meters with UXGA 60Hz.

#### - Recommended Specifications of Fibre-Optic Cables

Parameters	Conditions	Specifications
Fibre Type		50/125μm Multi-mode Graded Index Glass Fibre
Modal Bandwidth	$\lambda = 850$ nm	Min. 400 MHz km
Fiber Cable Attenuation	$\lambda = 850$ nm	Max. 3.5dB/km
Extension Distance		10 – 1650ft (500 meter)
No. of Ferrules	A pair of duplex LC* or 4 simplex LCs	4 ferrules
Skew		Max. 0.4ns
Insertion Attenuation		Max. 0.5dB
Total Optical Attenuation	In 330 ft (100 meter) extension	Max. 1.5dB

Note\*: some plastic couplers to clamp two LC connectors could not fit in.

# Functions

#### - Self-EDID Function

The EDID in a display can be read and restored by just plugging it to the display. This self-EDID programming feature makes the installation of M1-201SA more easy and flexile at any variable resolution display systems.

#### - Power Save Mode in Transmitter Module

The laser diodes are lit only when +5V voltage should be supplied into the 14-pin in DVI connectors. The voltage passing through a regulator has LD drive circuit work.

#### - Signal Detect Mode in Receiver Module

It offers squelch function blocking output signals when optical input power is lower than as specified in a certain case, for instance, loosing optical connectors.



# Drawing

Dimension [mm]



Note: The transmitter, M1-201SA-T and the receiver, M1-201SA-R have the same mechanical dimensions.

## **Fiber Connection**

The diagram shows the connection of transmitter (Tx; plug in PCs) and receiver (Rx; plug in displays) modules by using 2 dual LC patch cords fibers or 4 separate LC patch cord fibers.

Warning; two dual LC patch cords made by some manufacturers could not fit in together since width of their plastic couplers are too wide to plug in M1-201-TR's LC receptacles. We recommend it to be 12.40 mm (not over 13.0mm).



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# **DVI Pin Description**

Pin	Symbol	Functional Description	
1	CH2-	TMDS Data Signal Channel 2 Negative	
2	CH2+	TMDS Data Signal Channel 2 Positive	
3	GND	TMDS Data Signal Channel 2/4 Shield	
4	CH4-	TMDS Data Signal Channel 4 Negative	
5	CH4+	TMDS Data Signal Channel 4 Positive	
6	DDC Clock	DDC Clock line for DDC2B communication	
7	DDC Data	DDC Data line for DDC2B communication	
8	N.C.		
9	CH1-	TMDS Data Signal Channel 1 Negative	
10	CH1+	TMDS Data Signal Channel 1 Positive	
11	GND	TMDS Data Signal Channel 1/3 Shield	
12	CH3-	TMDS Data Signal Channel 3 Negative	
13	CH3+	TMDS Data Signal Channel 3 Positive	
14	5 V	Main Power Input for Transmitter from Host (Note10)	
	5.4	5 V Output for Receiver to monitor	
15	GND	Ground	
16	Hot plug Detect	Signal is driven by monitor to enable the system to identify the presence of a monitor	
17	CH0-	TMDS Data Signal Channel 0 Negative	
18	CH0+	TMDS Data Signal Channel 0 Positive	
19	GND	TMDS Data Signal Channel 0/5 Shield	
20	CH5-	TMDS Data Signal Channel 5 Negative	
21	CH5+	TMDS Data Signal Channel 5 Positive	
22	GND	TMDS Clock Signal Shield	
23	CLK+	TMDS Clock Channel Positive	
24	CLK-	TMDS Clock Channel Negative	

Note10) The AC-to-DC adapter for transmitter is option for Desk Top PC user. But Note PC user has to use the AC-to-DC adapter because the power of Note PC is not enough to drive M1-201SA transmitter.



# **Reliability Test**

Opticis utilizes three types of test criteria for a reduction of variability and a continuous improvement of the process by its FEMA (Failure Mode and Effective Analysis) program.

- 1) Mechanical test (vibration, shock)
- 2) Temperature & humidity tests
- 3) EMC test (FCC class A Verification and CE Documentation)

### Mechanical and Temperature & Humidity Test Data

Heading	Test	Conditions	Duration	Sample Size	Failure	Remarks
Operating Test	Operating at each Temperature	* 0 ~ 50 °C (Interval: 10 °C)	30 Min (Each Temperature)	n =11	0	Note: Visual Test on the Display Pixel Error Rate
	High Temperature	* T <sub>o</sub> = 70 °C	240 HR	n = 10	0	Note: Visual Test on the Display
Storage Test	Low Temperature	* T <sub>s</sub> = -30 °C	96 HR	n=2	0	1. TS: Storage Temperature
	High Temperature	* T <sub>s</sub> = 90 °C	96 HR	n=2	0	2. RH: Relative Humidity
	High Humidity High Temperature	* T <sub>s</sub> : 85 °C * RH: 85%	96 HR	n=6	0	
Mechanical	Mechanical Shock	* Pulse: 11 ms * Peak level: 30 g * Shock pulse: 3 times/Axis	-	n=2	0	
Test	Mechanical Vibration	* Peak acceleration: 20 g * Frequency: 20~2000 Hz * Sweep time: 30 Minutes * 4 Times/Axis	-	n=2	0	



#### EMC Test Data

#### 1) EMI: Meet <u>FCC class A</u> (ICES-003) and <u>CE class A</u>

STAND	CONDITIONS	
EN 55 022 (CISPR22) FCC; PART 15 SUBPART B	CE (Conducted Emission) & RE (Radiated Emission)	Meet Class A
EN 61000-3-2 (IEC 61000-3-2)	Harmonics	Meet Class A
EN 61000-3-3 (IEC 61000-3-3)	Flickers	Meet Class A

#### 2) EMS: Meet <u>CE standards (EN 55024) and CISPR24 equivalents</u>

	CONDITIONS	
EN 61 000-4-2:1995	Electrostatic Discharge Immunity (Air: 8kv, Contact: 4kv)	Meet Criterion B
EN 61 000-4-3:1996	Radiated RF E-Field (80~1000 MHz) 3V/m (AM 80%, 1kHz)	Meet Criterion A
EN 61 000-4-4:1995	Fast Transients (5kHz, 60Seconds)	Meet Criterion B
EN 61 000-4-5:1995	Surge Transients	Meet Criterion B
EN 61 000-4-6:1996	Conducted Susceptibility (CS) Radiated Susceptibility (RS)	Meet Criterion A
EN 61 000-4-11:1994	Voltage Dips, Interruption & Variation	Meet Criterion C

# Terminology

DDC DVI-D	Digital Display Channel. Latest specification is DDC2B. Digital Visual Interface. Digital connection only – no analog.
EDID	Extended Display Identification Data. EDID parameters are sent over the DDC link.
EMI	Electro Magnetic Interference.
EMS	Electro Magnetic Susceptibility.
HDCP	High Definition Content Protection. These parameters are part of the 2002 High
	Definition Multimedia Interface (HDMI) specification for Consumer Electronics.
PDP	Plasma Display Panel. Large HDTV panels up to 63" use this display technology.
RFI	Radio Frequency Interference.
TFT-LCD	Thin Film Transistor Liquid Crystal Display – the technology of most computer display panels with VESA resolutions up to 1600x1200 pixels.
TMDS	Transmission Minimized Differential Signalling is the Silicon Image Inc. protocol for the digital signals.
VCSEL	Vertical Cavity Surface Emitting Laser transmitter diode. The receiver diode is the PIN- Photo Diode. These components are designed and manufactured by Opticis.
VESA	Video Electronics Standards Association.



# **Revision History**

Version	date	History
1.2	2013-09-03	HQ Address updated
1.3	2015-01-02	Feature updated. Storage Relative Humidity updated.
1.4 2015-02-10	M1-201SA-T, Supply current and Power Dissipation updated.	
	2015-02-10	Extinction Ratio removed.