

# DATA SHEET

## Optical DVI/Audio/Control Extender

### M5-1002

#### Contents

- ◆ Description
- ◆ Features
- ◆ Absolute Maximum Ratings
- ◆ Recommended Operating Conditions
- ◆ Electrical Power Supply Characteristics
- ◆ Optical and Electrical Characteristics
- ◆ Drawing of transmitter and receiver modules
- ◆ DVI Pin Description
- ◆ Reliability Test of Modules
- ◆ Terminology

#### Headquarters

Opticis Co., Ltd  
# 501, Byucksan Technopia  
434-6 Sangdaewon-Dong, Chungwon-Ku  
Sungnam City, Kyungki-Do, 462-120  
South Korea  
Tel: +82 (31) 737-8033  
Fax: +82 (31) 707-8079  
Email: sales@opticis.com  
[www.opticis.com](http://www.opticis.com)

#### North American Office

Opticis North America Inc.  
330 Richmond Street, Suite 100, Chatham,  
Ontario N7M 1P7  
Canada  
Tel: +1 (519) 355-0819  
Fax: +1 (519) 355-0502

## Optical DVI/Audio/Control Extender

### Description

M5-1002 offers extremely long extension of DVI, Stereo Audio and serial control data up to 10,000m over an 8/125um single-mode fiber cable with duplex SC connector. It is tremendously long over the limits of copper extensions like a few of meter of DVI and Audio.

Digital video, Audio, DDC and serial control data are all so encoded into a series of TTL data in the uplink module as to be transmitted over two fibers. Serial control data uplink and EDI Data for displays are oppositely so encoded in the downlink as to be transmitted to the source side over two fibers.

The duplex SC connection grants benefits of simplicity and robustness of connection for industry and commercial applications.

The DDC and Hotplug detect are fully complied with DDC2B standard.

The shipping group is as follows;

- 1) One pair of the uplink and the downlink
- 2) Two +12V/3A power adaptors
- 3) User Manual

## **Feature**

- ◆ Extends DVI, Audio and control data up to 10Km if using virtual DDC as an option. The DDC connection limit depends on DDC clock; e.g. 360m for 100 kHz and 1km for 20Hz.
- ◆ Audio interface: 3.5mm diameter Stereo Jack
- ◆ Serial control data: RS232 with 9 pin D-sub female connector in the Tx and Rx.
- ◆ Graphic/Video data: SXGA (1280X1024), 24bit color and 60Hz refresh rate with DVI-I female.
- ◆ Interconnection between TX and RX module: Duplex SC patch cord of 8/125um single mode fiber.
- ◆ +12 V DC power supply to each module
- ◆ Complies with DDC2B
- ◆ Mechanical Dimension of each (W/D/H in mm): 180/130/30

## **Applications**

- ◆ Digital display system integration for medical, military, aerospace, factory automation, and traffic control platforms.
- ◆ Digital FPD, PDP and projector installation in conference rooms, auditoriums and for kiosk systems
- ◆ LED signboards for large scale information display and stadiums

## Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Storage Temperature	$T_{stg}$	- 30	+ 70	°C
Supply Voltage	$V_{CC}$	10	16	V
Transmitter Differential Input Voltage	$V_d$	-	1	V
Relative Humidity	RH	10	85	%
Lead Soldering Temperature & Time	-	-	-	260°C, 10 sec

## Recommended Operating Conditions

Parameter	Symbol	Minimum	Typical	Maximum	Units
Ambient Operating Temperature	$T_A$	0		+ 50	°C
Data Output Load	$R_{LD}$		50		$\Omega$
Power Supply Rejection (Note1)	PSR		50		mV <sub>p-p</sub>
Supply Voltage	$V_{CC}$	+ 11.4	+ 12.0	+ 12.6	V

Note1. Tested with a 50mV<sub>p-p</sub> sinusoidal signal in the frequency range from 500 Hz to 500 MHz on the  $V_{CC}$  supply with the recommended power supply filter in place. Typically less than a 0.25 dB change in sensitivity is experienced.

## Electrical Power Supply Characteristics

( $T_A = 0$  °C to +50 °C, unless otherwise noted)

Parameter	Symbol	Minimum	Typical	Maximum	Units	
Supply Voltage	$V_{CC}$	11.4	12	12.6	V	
Supply Current	TX	$I_{TCC}$	-	600	650	mA
	RX	$I_{RCC}$	-	550	600	mA
Power Dissipation	TX	$P_{TX}$	-	7.20	8.2	W
	RX	$P_{RX}$	-	6.60	7.56	W

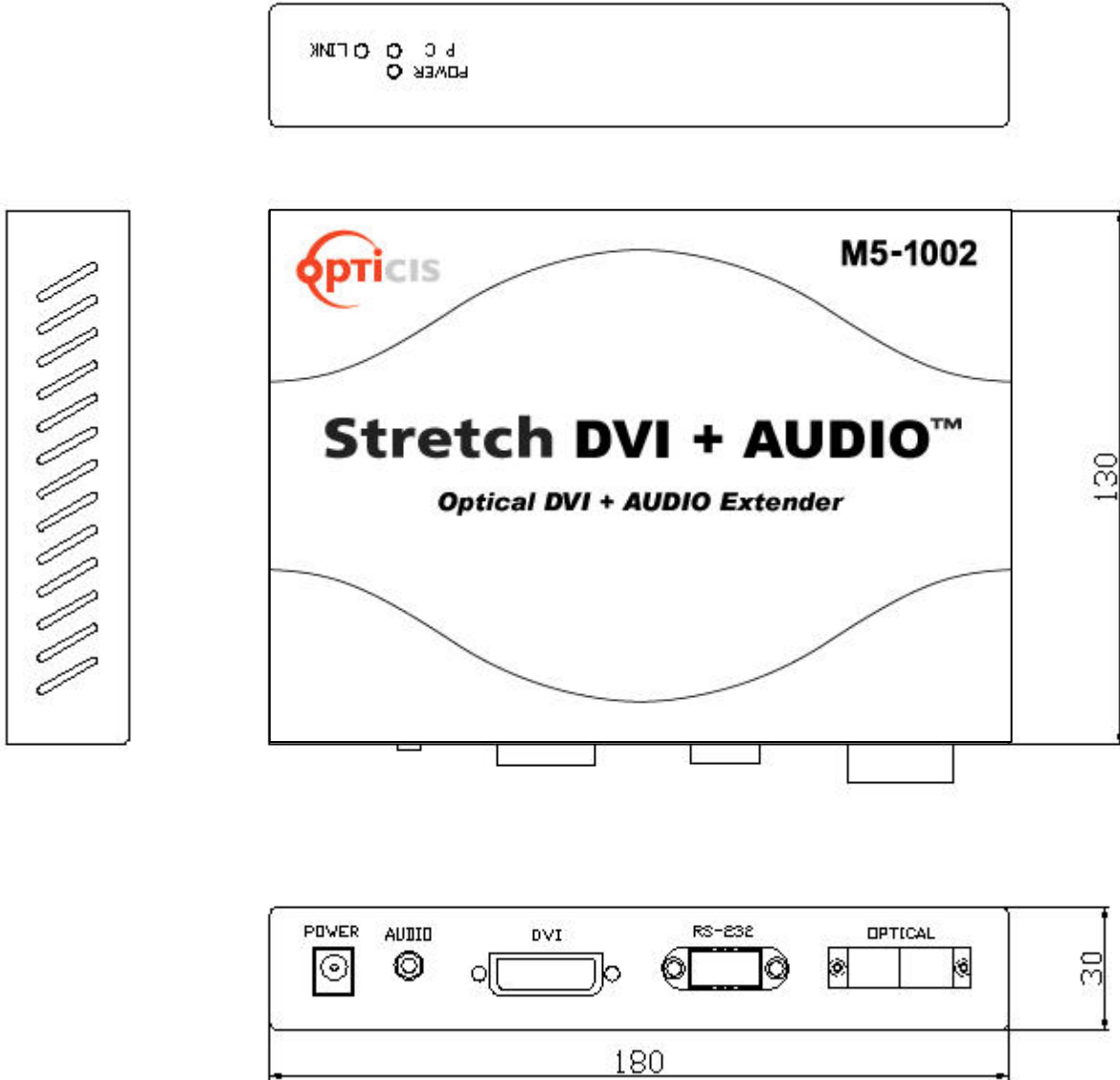
**Optical & Electrical Characteristics**

(T<sub>op</sub> = 25°C)

Parameters	Symbol	Condition	Unit	Min.	Typ.	Max.	Remark
Data Bit Rate	1310 Tx	PRBS 2 <sup>23</sup> -1,NRZ	Mbps		1250		
	1550 Rx				1250		
	1550 Tx	PRBS 2 <sup>23</sup> -1,NRZ	Mbps		1250		
	1310 Rx				1250		
Fiber Length 9μm core SMF		10 <sup>-10</sup> BER, 155Mbps /1.25Gbps	km	2			
<b>TRANSMITTER</b>							
Average Power Output	P <sub>OUT</sub>	I <sub>r</sub> =I <sub>BIAS</sub> + I <sub>mod</sub> /2	dBm	-11 -15	-9 -10	-7 -8	
Extinction Ratio	ER		dB	10			
Center Wavelength	c	CW, @ P <sub>OUT</sub>	nm	1270 1500	1310 1550	1355 1600	@1.31 μm @1.55 μm
Spectral Width		RMS Width	nm			4.0	
RIN			dB/Hz			-120	
Optical Rise/Fall Time	t <sub>r</sub> /t <sub>f</sub>	20 – 80%	nsec			0.26 2.0	
<b>RECEIVER</b>							
Sensitivity (Average Input Power)	P <sub>IN,MIN</sub>	PRBS 2 <sup>23</sup> -1, 10 <sup>-10</sup> BER	dBm			-19	1.25G Rx
Wavelength	1310 1550		nm	1260 1500	1310 1550	1360 1600	
Receiver Overload	P <sub>IN,MAX</sub>		dBm	-3.0			
Signal Detect Threshold Decreasing light input Increasing light input	P <sub>D</sub> P <sub>A</sub>		dBm dBm		P <sub>IN,MIN</sub> -3 P <sub>IN,MIN</sub> -2		
Signal Detect Hysteresis	P <sub>A</sub> - P <sub>D</sub>		dB	0.5			

**Drawing of transmitter and receiver modules**

Dimension [mm]



## 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 Shield
4		
5		
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 Shield
12		
13		
14	5 V	5 V Input for Transmitter from Host 5 V Output for Monitor from Receiver
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 Shield
20		
21		
22	GND	TMDS Clock Signal Shield
23	CLK+	TMDS Clock Channel Positive
24	CLK-	TMDS Clock Channel Negative

Note: Channels 3, 4 and 5 dual-link data signal pins are not used

## RS232C Pin Description

Pin	Symbol	Functional Description
1	Received Line Signal Detector	Connected with Pin4 & Pin6 in module
2	RD	Data Receive: Uplink $\leftrightarrow$ Downlink
3	TD	Data Transmit: Uplink $\leftrightarrow$ Downlink
4	Data Terminal Ready	Connected with Pin1 & Pin6 in module
5	GND	Signal Ground
6	Data Set Ready	Connected with Pin1 & Pin4 in module
7	Request To Send	Connected with Pin8 in module
8	Clear To Send	Connected with Pin7 in module
9	NC	

Connection tips:

- 1) Connection of PC-to-PC: Cross connection of pins 2 and 3 between two PCs.
- 2) Connection of PC-to-Device: Straight connection of pin 2:2 and pin 3:3

## 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 and CE Verification*)

### Mechanical and Temperature & Humidity Test Data

Heading	Test	Conditions	Duration	Sample Size	Failure	Remarks
<b>Operating Test</b>	Operating at each Temperature (See Note)	* 0 ~ 50 °C (Interval: 10 °C)	30 Min (Each Temperature)	n=3	0	<b>Note:</b> Visual Test on the Display
<b>Storage Test</b>	<b>Low Temperature</b>	* T <sub>s</sub> = -30 °C	96 HR	n=3	0	1. TS: Storage Temperature
	<b>High Temperature</b>	* T <sub>s</sub> = 70 °C	96 HR	n=3	0	2. RH: Relative Humidity
	<b>High Humidity High Temperature</b>	* T <sub>s</sub> : 60 °C * RH: 90%	96 HR	n=3	0	
<b>Mechanical Test</b>	<b>Mechanical Shock</b>	* Pulse: 11 ms * Peak level: 30 g * Shock pulse: 3 times/Axis	-	n=2	0	
	<b>Mechanical Vibration</b>	* Peak acceleration: 20 g * Frequency: 20~2000 Hz * Sweep time: 30 Minutes * 4 Times/Axis	-	n=2	0	

**EMC Test Data**

**1) EMI: Meet FCC class A (ICES-003) and CE class A**

<b>STANDARDS</b>		<b>CONDITIONS</b>
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 CE standards (EN 55024) and CISPR24 equivalents**

<b>STANDARDS</b>		<b>CONDITIONS</b>
EN 61 000-4-2:1995	Electrostatic Discharge Immunity (Air: 8kv, Contact: 4kv)	Meet Criterion A
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 A
EN 61 000-4-5:1995	Surge Transients	Meet Criterion A
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 A and C