DATA SHEET

Optical DVI/USB/RS232/Audio Extender

M5-1003

Contents

Headquarters

Optolinks
46 Corporate Park #130
Irvine, CA 92606
949-701-4742
info@vigillink.com

Optical DVI/RS-232/USB/Audio Extender

Description

The reality of gigabit high-speed digital graphic interconnections mandates products that maintain front-of-screen video quality. Optical technology extends the ability to transmit digital graphic data beyond the physical limits of copper wires by, i) providing pure signal integrity over long distances for the optimum visual experience, ii) no EMI/RFI transmission or reception, iii) light weight, rugged cabling and connectors, iv) very cost effective per foot/metre, v) low power consumption, and vi) plug and go installation ease – no software requirements.

M5-1003-TR offers integrated extension of digital video, audio and RS-232 interface up to 2km (6,560 ft) for DVI. The graphic resolution of this M5-1003 supports is WUXGA (1920x1200) at 60Hz refresh rate. The USB follows High-speed USB, version 2.0 (480Mbps). The audio supports stereo audio. RS232 serial interface offers device-to-device and device-to-controller connections to build up control system integration.

It is designed to multiplex and de-multiplex the DVI video, stereo audio, Display Data Channel (DDC) command interface, serial protocol so as to be linked over 4 LC fibers. It gives benefits of all-glass fiber transmission medium, data security, and long distance extension up to 2km, easy plug-and-go installation and no RFI/EMI effects. In addition, a non-trivial feature is that both of Single and Multimode optical fibers are applicable.

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 M5-1003 more easy and flexile at any variable resolution display systems.

The M5-1003-TR consists of an Uplink (or transmitter; Tx) and a Downlink (or receiver; Rx), connected by two duplex LC terminated single or multi-mode patch cords between them, which offers electrical perfect isolation. Each link module is driven by +12V/3A DC power adaptor.

The shipping group is as follows;

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

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Feature

- Extends DVI, Audio and RS232 with both single and multi-mode fibers
  - up to 2km (6,560ft) over two (2) duplex LC single-mode fibers.
  - up to 500m (1,640ft) over two (2) duplex LC multi-mode fibers.
- Video data: WUXGA (1920X1200), 24bit color and 60Hz refresh rate for DVI.
- Audio interface: 3.5mm diameter stereo jack.
- Serial control data: RS232 with 9-pin D-sub female connector in the transmitter and male connector in the receiver.
- Interconnection between transmitter and receiver: Two (2) Duplex LC patch cords of single or multi-mode fiber.
- Applicable of both single and multi-mode fiber.
- Offers DVI and USB ports for Local Display and Keyboard/Mouse.
- Lossless Image Quality with no Frame Dropping.
- +12 V DC power supply to each module.
- 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.
- Offers optional remote console switch and indicators.
- No software to install; just plug and go.
- Data security with negligible RFI/EMI emissions
- Certifications: CE / FCC, Class 1 Laser Eye Safety

Applications

- Keyboard, mouse and video extension and routing system related with servers or PCs control.
- 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
Operating 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		Ω
Power Supply Rejection (Note1)	PSR		50		mV_{p-p}
Supply Voltage	V_{CC}	+ 11.4	+ 12.0	+ 12.6	V

Note1. Tested with a 50mV_{p-p} 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}	720	750	780	mA
	RX	I_{RCC}	660	690	720	mA
Power Dissipation	TX	P_{TX}	8.0	9.0	10.0	W
	RX	P_{RX}	7.5	8.3	9.1	W

DVI Electrical Characteristics

Transmitter						
Parameter		**Symbol**	**Minimum**	**Typical**	**Maximum**	**Units**
TMDS	Data Output Load	R_{LD}		50		Ω
	Graphic Supply Voltage (Note2)	GV_{CC}	+ 3.1	+ 3.3	+ 3.5	V
	Single-Ended High Level Input Voltage	GV_{IH}	GV_{CC} - 0.01	GV_{CC}	GV_{CC} + 0.01	V
	Single-Ended Low Level Input Voltage	GV_{IL}	GV_{CC} - 0.6	-	GV_{CC} - 0.4	V
	Single-Ended Input Swing Voltage	GV_{ISWING}	0.4	-	0.6	V
Receiver						
Parameter		**Symbol**	**Minimum**	**Typical**	**Maximum**	**Units**
TMDS	Data Input Load	R_{LD}		50		Ω
	Graphic Supply Voltage (Note2)	GV_{CC}	+ 3.1	+ 3.3	+ 3.5	V
	Single-Ended Output Swing Voltage (Note3)	GV_{ISWING}	0.2	-	0.4	V

Note2. Graphic Supply Voltage is regulated reference voltage for signal processing in modules
Note3. TMDS outputs are coupled in AC

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Optical & Electrical Characteristics

(T_{op} = 25℃)

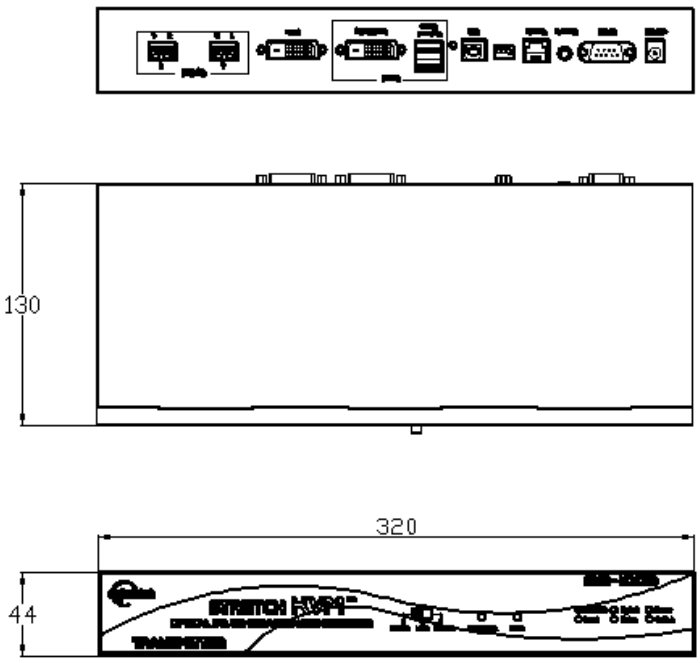
Parameters		Symbol	Condition	Unit	Min.	Typ.	Max.	Remark
Data Bit Rate	1310 Tx		PRBS 2^{23}-1,NRZ	Mbps		1250		
	1550 Rx					155.52		
	1550 Tx		PRBS 2^{23}-1,NRZ	Mbps		155.52		
	1310 Rx					1250		
Fiber Length 9μum core SMF			10^{-10} BER, 155Mbps/1.62Gbps	km	2			
TRANSMITTER								
Average Power Output		P_{OUT}	$I_f=I_{BIAS}+I_{mod}/2$	dBm	-11 -15	-9 -10	-7 -8	
Extinction Ratio		ER		dB	4			
Center Wavelength		c	CW, @ P_{OUT}	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_r/t_f	20 – 80%	nsec			0.26 2.0	
RECEIVER								
Sensitivity (Average Input Power)		$P_{IN,MIN}$	PRBS 2^{23}-1, 10^{-10} BER	dBm			-23 -19	155M Rx 1.25G Rx
Wavelength	1310 1550			nm	1260 1500	1310 1550	1360 1600	
Receiver Overload		$P_{IN,MAX}$		dBm	-3.0			
Signal Detect Threshold Decreasing light input Increasing light input		 P_D P_A		 dBm dBm		 $P_{IN,MIN}$-3 $P_{IN,MIN}$-2		
Signal Detect Hysteresis		P_A - P_D		dB	0.5			
Audio (Analog)								
Analog Sample Rate		F_{audio_a}		kHz		48		
Input level		Ain		Vpp		0.56Vss		
Output level		Aout	Vpp=3.3V/Analog	Vpp		0.65		
Input Impedance				kΩ		25		
Output Impedance				Ω		100		

RS232 Electrical Characteristics

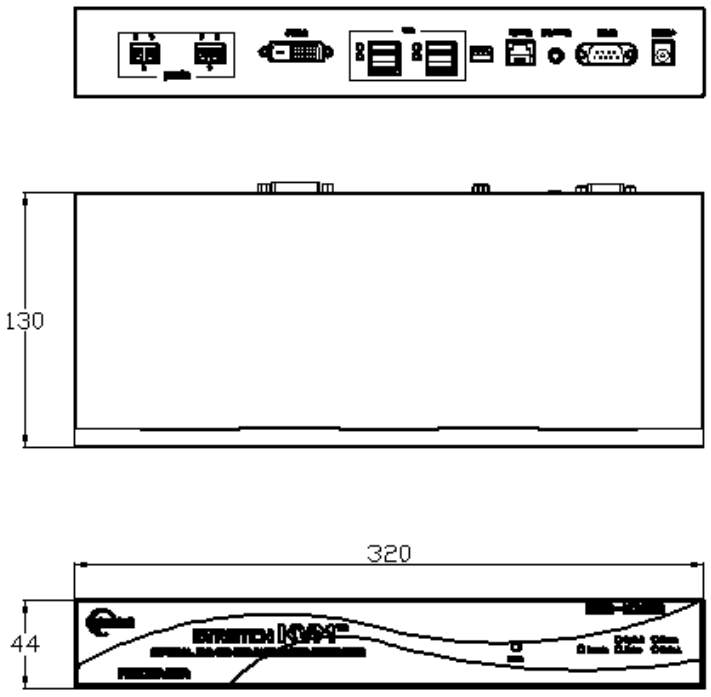
Parameter	Symbol	Minimum	Typical	Maximum	Units
Data rate				250	kbps
Input voltage	Rin	-25		25	V
Output voltage	Tout		±15		V

Drawing of transmitter and receiver modules

Dimension [mm]



Transmitter



Receiver

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 ←→ Downlink
3	TD	Data Transmit: Uplink ←→ 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
Operating Test	Operating at each Temperature (See Note)	* 0 ~ 50 ˚C (Interval: 10 ˚C)	30 Min (Each Temperature)	n =3	0	**Note:** Visual Test on the Display
Storage Test	**Low Temperature**	* T_S = -30 ˚C	96 HR	n=3	0	1. TS: Storage Temperature
	High Temperature	* T_S = 70 ˚C	96 HR	n=3	0	2. RH: Relative Humidity
	High Humidity High Temperature	* T_S: 60 ˚C * RH: 90%	96 HR	n=3	0	
Mechanical Test	**Mechanical Shock**	* Pulse: 11 ms * Peak level: 30 g * Shock pulse: 3 times/Axis	-	n=2	0	
	Mechanical Vibration	* Peak acceleration: 20 g * Frequency: 20~2000 ㎐ * 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*

STANDARDS		*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 *CE standards (EN 55024) and CISPR24 equivalents*

STANDARDS		*CONDITIONS*
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