

DATA SHEET

Optical HDMI Extension Module

M1-2R2H-TR

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Optical HDMI Extension Module

- HDMI Fiber Detachable Connection System -

Description

The M1-2R2H-TR HDMI (High Definition Multimedia Interface) extension module is a new member of the Opticis family of products that stretches your HDMI connectivity, offering a benefit of detachability of connection with a four (4) LC fiber cable and a UTP (Untwisted Pair) cable, which makes it easier to install.

The reality of high-speed digital graphic interconnections mandates products to maintain video quality and cost effectiveness of integrated display systems. Optical technology for gigabit digital transmission makes it simple to extend digital graphic data above the extension limits of copper wires providing pure signal integrity for an ideal visual experience, no EMI/RFI emissions, light weight, rugged cabling and connectors, low power consumption and installation ease.

The extension system consists of transmitter and receiver module boxes with female HDMI receptacles, being able to connect Set-top boxes or DVDP's and digital HD-TV's by short HDMI copper cables respectively. A LC patch cords fiber-optic cable enables to transmit HD-TV data (1080p) and a UTP cable with RJ-45C enables to manage power and EDID/HDCP parameters up to 100m (330ft). Internally, Opticis' optical technology - the transmitter's 850nm VCSEL array and the receiver's Pin-PD array, are concealed within the connector housings. The UTP cable with RJ-45C connectors for DDC, which is popular as LAN cables, is so designed as to utilize easily.

The product is certified to EMI Class B by for FCC or CE for home uses as well as industrial or commercial uses.

If you want to extend only HD-TV data neglecting HDCP, the product allows you to connect only a two-duplex LC patch cord fibre cable without a UTP cable and offers longer extension up to 500m (1,650feet).

The shipping group is shown as follows;

- 1) One transmitter converting electrical to optical signals, model name: M1-2R2H-T
- 2) One receiver converting optical to electrical signals, model name: M1-2R2H-R
- 3) HDMI copper cables: 2 X M1-HVCO-010 (1.0m)

- 4) AC/DC +12V power adapter: M1-2D12PW
- 5) Copper cable for DDC (Option): M1-DDCRJ-xxx (RJ45-C Connector), where xxx stands for the cable length in meter up to 100m (330 feet). The standard length is 20 meter (66feet).
- 6) Fiber-optic Break-out cable with 4xLC connectors (Option), being strongly recommended for use in harsh environments: LDP-625BO-xxx, where xxx stands for the cable length up to 500m (1,650 feet).

Features

- ◆ Comply with HDMI 1.2 standard for HD-TV and HDCP communication.
- ◆ Extend digital HDTV data with HDCP upto 100m (330 feet).
- ◆ Be certified in Class B, the home standard by FCC or CE.
- ◆ Support up to HDTV 1080p (1,920x1,080) as well as WUXGA (1,920x1,200) resolution at 60Hz refresh rate with 1 pixel/clock mode.
- ◆ Adopt a +12V external power supply to supply both modules over DDC cable.
- ◆ Not require S/W driver to install; just plug and play.
- ◆ Use 850nm multimode light sources and equivalent photo detectors, so recommend 2 duplex LC patch-cord multimode GOF buffered cables or 4xLC breakout GOF cable.
- ◆ Adopt 2 Duplex LC receptacles on the side-face of modules.
- ◆ Comply with FDA/CDRH and IEC 60825-1 Class 1 Laser Eye Safety.

Applications

- ◆ Digital HD-TV of types of LCD, PDP, projection and projectors for Home or Commercial Entertainments
- ◆ Digital HD-TVs for industrial applications such as medical appliances, aero traffic control, factory, conference room, auditorium and bank
- ◆ Digital FPDs and projectors in conference room and auditorium
- ◆ Kiosk with digital FPDs showing full motion graphic displays from remote systems
- ◆ HD-TVs for information display in public sites
- ◆ LED signboards in streets or in stadiums

Technical Specifications

- General Specifications

	Parameter	Specifications
Components	Laser Diodes in Tx Module	850nm Multi-mode VCSEL (Vertical Cavity Surface Emitting Laser)
	Photo Diodes in Rx Module	GaAs PIN-PD
Electrical	Input and Output Signals	TMDS Level (complying with DV11.0)
	Data Transfer Rate (Graphic Data)	Max. 1.62Gbps
	Total Jitter at the end of Rx output	Max. 309 ps
	Skew inter-channels	Max. 6ns
Optical	Link Power Budget	Min 10.5dB
Connect	Optical Connector	2 Duplex LC connectors
	Electric Connector Type from Modules and to HDTVs	HDMI receptacle
	DDC Electric Cables between Two Modules	RJ45-C
	Recommended Fiber	62.5/125 or 50/125 um Multi-mode Glass Fiber

- Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Supply Adaptor Voltage	V _{CC}	+ 10.0	+16.0	V
Operating Temperature	T _{op}	-10	50	°C
Operating Relative Humidity	RH _{op}	5	80*	%RH
Storage Temperature	T _{sto}	- 30	+ 60	°C
Storage Relative Humidity	RH _{sto}	5	95*	%RH

Note*: Under the condition of No drops of dew

- Operating Conditions

Transmitter module : M1-2R2H-T

	Parameter	Symbol	Minimum	Typical	Maximum	Units
Power Supply	Supply Adaptor Voltage	AV _{CC}	11.4	12	12.6	V
	Supply Voltage	V _{CC}	11.4	12	12.6	V
	Supply Current	I _{TCC}	-	200	250	mA
	Power Dissipation	P _{TX}		2.4	3.15	W
	Power Supply Rejection (Note1)	PSR		50		mV _{p-p}
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}	0.2	-	0.8	V
Optical Link (Notes3)	Output Optical Power	P _o	-9.5		-3.6	dBm
	Wavelength	λ	830	850	860	nm
	Spectral width in RMS	Δλ			0.85	nm
	Relative Intensity of Noise (Note4)	RIN		-117		dB/Hz
	Extinction Ratio	Ext	9			dB
	Rising/Falling Time	T _{rise} /T _{fall}			260	ps
Jitter in p-p value (Note5)	T _{jitter}			290	ps	

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.

- 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: M1-2R2H-R

	Parameter	Symbol	Minimum	Typical	Maximum	Units
Power Supply	Supply Adaptor Voltage	AV _{CC}	11.4	12	12.6	V
	Supply Voltage	V _{CC}	11.4	12	12.6	V
	Supply Current	I _{RCC}	-	300	350	mA
	Power Dissipation	P _{RX}	-	3.6	4.41	W
	Power Supply Rejection (Note6)	PSR		50		mV _{p-p}
TMDS	Data Input Load	R _{LD}		50		Ω
	Graphic Supply Voltage (Note7)	GV _{CC}	+ 3.1	+ 3.3	+ 3.5	V
	Single-Ended Output Swing Voltage (Note8)	GV _{ISWING}	0.4	-	0.8	V
Optical Link (Note9)	Receiving Optical Power	P _o	-20		-3.6	dBm
	Receiving Wavelength	λ	830	850	860	nm
	Signal Detect Good	SDg			-17	dBm
	Signal Detect Fail	SDf	-25			dBm
	Link Power Budget	P _{bgt}	10.5			dB
	Total Jitter (note 10)	TR _{jitter}			309	ps

- Note6. 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.
 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 Fiber-Optic Cables

Parameters	Conditions	Specifications
Fiber Type	Multimode Glass of Fiber	62.5/125 or 50/125μm
Modal Bandwidth	λ = 850nm	Min. 400 MHz km
Fiber Cable Attenuation	λ = 850nm	Max. 3.5dB/km
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

- Power Save Mode in Transmitter Module

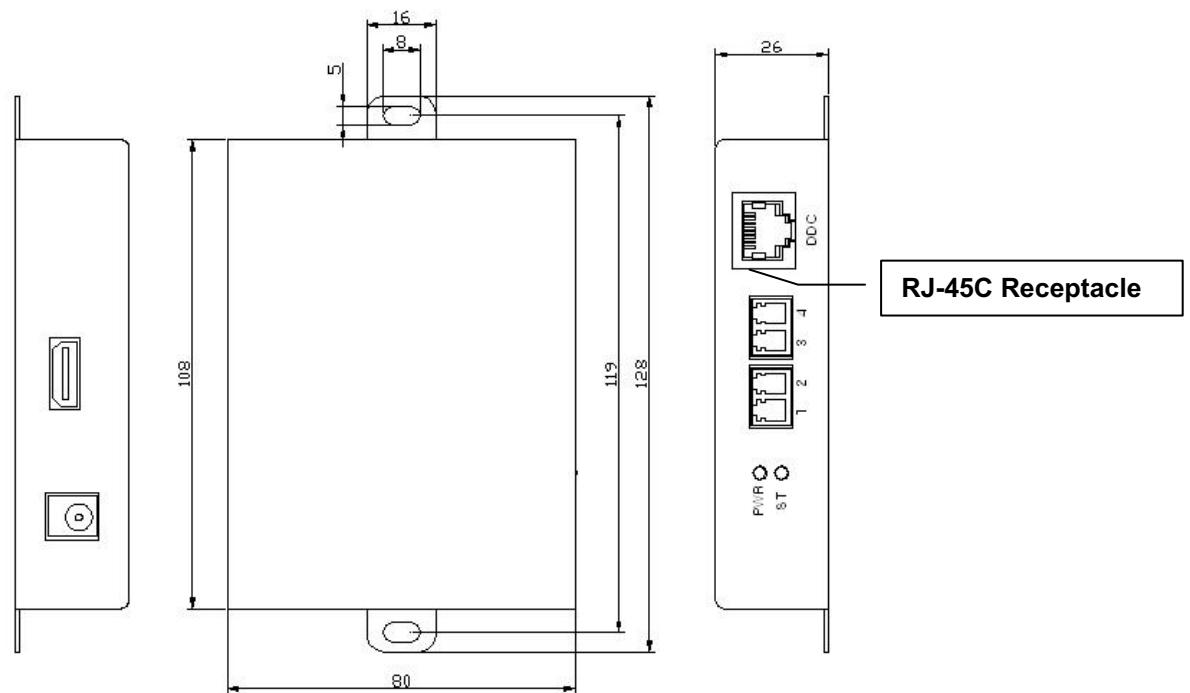
The laser diodes work only when +5V voltage should be supplied into the 14-pin in DVI connectors, that is, detecting plugging the DVI plug to the PC. The voltage passing through a regulator from the +5V PC power or external power has LD drive circuit work.

- 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, that is, detecting losing the LC fiber-optic patch cord.

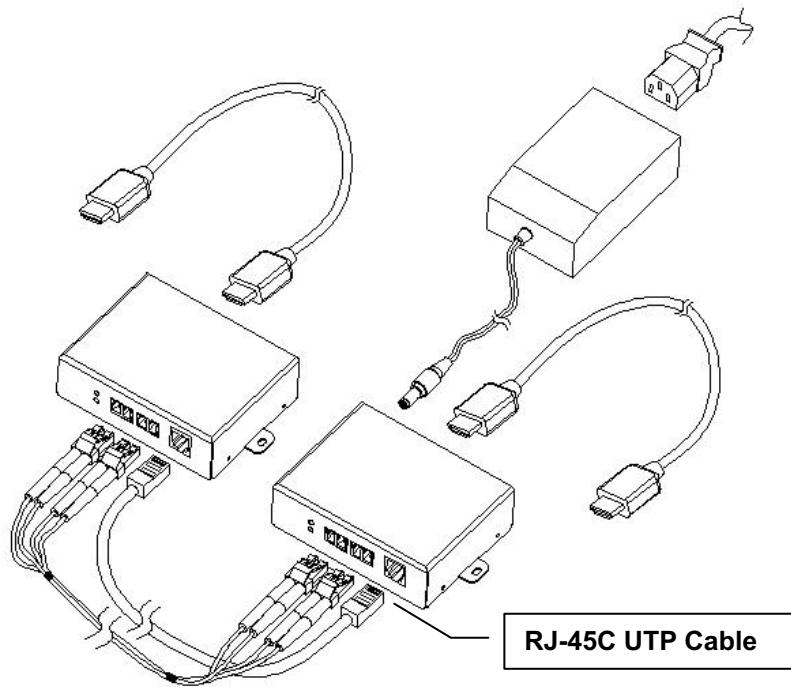
Drawing of Modules

Dimension [mm]



Note: The transmitter, M1-2R2H-T and the receiver, M1-2R2H-R have the same mechanical dimensions.

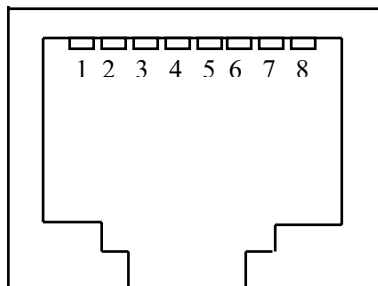
Drawing of Cable Connections



HDMI Pin Description

Pin	Symbol	Functional Description
1	CH2+	TMDS Data Signal Channel 2 Positive
2	GND	TMDS Data Signal Channel 2 Shield
3	Ch2-	TMDS Data Signal Channel 2 Negative
4	CH1+	TMDS Data Signal Channel 1 Positive
5	GND	TMDS Data Signal Channel 1 Shield
6	CH1-	TMDS Data Signal Channel 1 Negative
7	CH0+	TMDS Data Signal Channel 0 Positive
8	GND	TMDS Data Signal Channel 0 Shield
9	CH0-	TMDS Data Signal Channel 0 Negative
10	CLK+	TMDS Clock Channel Positive
11	GND	TMDS Clock Signal Shield
12	CLK-	TMDS Clock Channel Negative
13	CEC	Consumer Electronics Control
14	Reserved	Not used
15	SCL	HDCP/DDC communication clock
16	SDA	HDCP/DDC communication data
17	GND	DDC/CEC shield
18	5V	5 V Input for Transmitter from Host
		5 V Output for Monitor from Receiver
19	Hot plug Detect	Signal is driven by monitor to enable the system to identify the presence of a monitor

Pin Description for DDC Connector



Pin	Symbol	Functional Description
1	DDC Data GND	DDC Data line return ground
2	DDC Data	DDC Data line for DDC2B communication
3	DDC Clock GND	DDC Clock line return ground
4	Power GND	Main power return ground
5	Power	Main power for Opticis module
6	DDC Clock	DDC Clock line for DDC2B communication
7	5V_IN	DVI 5V (DVI No. 14 pin for Monitor)
8	HPD	Signal is driven by monitor to enable the system to identify the presence of a monitor

Reliability Test

We have three kinds of test criteria for a reduction of variability and a continuous improvement of the process by our FMEA (Failure Mode and Effective Analysis) program.

- 1) Mechanical test (Vibration, Shock)
- 2) Temp. & Humidity test
- 3) EMC test (FCC class A and CE Verification for M1-2R2-TR; FCC class B and CE Certification for M1-2S2-TR)

Mechanical and Temp. & Humidity Test

Heading	Test	Conditions	Duration	Sample Size	Remarks
Operating Test	Operating at each Temperature (See Note)	-10~50°C (Interval: 10°C)	30 Min (Each Temperature)	n=3	Note: Evaluate display quality of Laser Beam Projector connected to Graphic Signal Generator (Quantum Data: GD-802B) at each temperature. 1. T _S : Storage Temperature 2. RH: Relative Humidity
Storage Test	Low Temperature	T _S = -30°C	96 HR	n=3	
	High Temperature	T _S = 60°C	96 HR	n=3	
	High Humidity / High Temperature	T _S : 60°C RH: 85%	96 HR	n=3	
Mechanical Test	Mechanical Shock	Pulse: 11 ms Peak level: 30 g Shock pulse: 6times/Axis	-	n=3	
	Mechanical Vibration	Peak acceleration: 5 g Frequency: 10~55 Hz Sweep time: 5 Minutes 2 Times/Axis	-	n=3	

EMC Test



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

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

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

Terminology

HDMI	High Definition Multimedia Interface. Digital connection only – no analog.
HDCP	High-bandwidth Digital Content Protection. These parameters are part of the 2002 High Definition Multimedia Interface (HDMI) specification for Consumer Electronics.
DDC	Digital Display Channel. Latest specification is DDC2B.
EDID	Extended Display Identification Data. EDID parameters are sent over the DDC link.
EMI	Electro Magnetic Interference.
RFI	Radio Frequency Interference.
EMS	Electro Magnetic Susceptibility.
PDP	Plasma Display Panel. Large HDTV panels up to 63” use this display technology.
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.

Revised on August 16, 2006; adding supporting resolution for HDTV at page 2

Updated only for HDMI model, M1-2R2H-TR on 12 April 2007