

# DATA SHEET

## DVI - HDCP Extension Cable

### M1-1P0E

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# Optical DVI - HDCP Extension Cable

**\* Point-to-point optical fibre cable \***

## Description

The M1-1P0x DVI / HDMI extension cable is a new member of the Opticis family of products that stretches your digital visual interface connectivity. The M1-1P0x is a hybrid cable solution using four H-PCF (Hard-Polymer Clad Fibre) or multi-mode glass fibers for the Red, Green, Blue and Clock high-speed digital graphic signals and copper wires for the low frequency DDC / HDCP control signals, wrapped in a PVC jacket.

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.

The product consists of a transmitter and a receiver, which are connected by bundled optical fibre and copper cables. There are male DVI-D connectors at each end. The high-speed graphic data transmission is accomplished by using a VCSEL array inside the transmitter connector, and a Pin-PD array inside the receiver connector.

The shipping group is as follows;

- 1) One DVI / HDMI cable: M1-1P0E-yyy, where y = length in metres.
- 2) Factory will stock "standard" lengths of 10m, 20m, 30m, 50m, 70m and 100m.
- 3) User Manual and Quick Installation Guide

## **Features**

- ◆ Extend digital graphic signals up to 100m (330ft) with no signal degradation.
- ◆ Supports up to WUXGA (1920x1200) resolution at 60Hz refresh rate.
- ◆ Complies with DVI standard (165Mpixels/sec maximum) and supports DDC2B mode.
- ◆ Complies with HDMI standard supporting HDCP parameters.
- ◆ Uses the PC host +5V source from the video card's DVI pin number 14 to drive the Tx and Rx modules, assuming a minimum of 500mA is available from the PC.
- ◆ Auto power switching circuit offers an option of whether to use an AC/DC power adapter depending on power supply capability of PC graphic card.
- ◆ The transmitter (Tx) module is designed to protect the conflict of power supply between the external DC power adapter and PC.
- ◆ Connectors are compact and light enough to directly plug into the graphic controller card and panel display.
- ◆ Data security inherent with fibre & no RFI/EMI emissions.
- ◆ No software required; plug and play.
- ◆ User Manual and Quick Installation Guide are available in non-supplier specific format for "white box" sales.

## **Applications**

- ◆ Digital TFT-LCD FPDs, PDPs and projectors for medical imaging, air traffic control, factory automation, conference rooms, auditorium A/V systems, etc.
- ◆ Kiosks with digital FPDs showing full motion graphic displays from remote systems
- ◆ PDP displays for information display in public sites.
- ◆ LED signboards in streets and stadiums.
- ◆ Home Theatre applications

## Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Storage Temperature	T <sub>stg</sub>	- 10	+ 70	°C
Supply Voltage	V <sub>CC</sub>	- 0.3	+ 6.0	V
Transmitter Differential Input Voltage	V <sub>d</sub>	-	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 <sub>A</sub>	0		+ 50	°C
Data Output Load	R <sub>LD</sub>		50		Ω
Power Supply Rejection (Note1)	PSR		50		mV <sub>p-p</sub>
Supply Voltage	V <sub>CC</sub>	+ 4.5	+ 5.0	+ 5.5	V
Graphic Supply Voltage (Note2)	GV <sub>CC</sub>	+ 3.0	+ 3.3	+ 3.6	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<sub>CC</sub> supply with the recommended power supply filter. Typically less than a 0.25 dB change in sensitivity is experienced.

Note2. Graphic Supply Voltage is only for the Graphic Signal Interface which is generated by regulator in the Transmitter and Receiver

## Electrical Power Supply Characteristics

- For M1-1P0E, where +5Volt PC power is derived from pin 14 of the DVI-D connector: The power supply fully specified by the DDWG DVI spec has to have a capability more than 500mA. Auto power switching function of M1-1P0E offers an option of whether to use an AC/DC power adapter depending on power supply capability of PC graphic card.
- For M1-1P0E with the Auto power switching circuit, the characteristics are as follows;

Parameter	Symbol	Minimum	Typical	Maximum	Units	
Supply Voltage	V <sub>CC</sub>	4.5	5	5.5	V	
Supply Current	TX	I <sub>TCC</sub>	-	170	200	mA
	RX	I <sub>RCC</sub>	-	130	150	mA
Power Dissipation	TX	P <sub>TX</sub>	-	0.85	1.1	W
	RX	P <sub>RX</sub>	-	0.65	0.825	W

**Transmitter Electrical Interface** ( $T_A = 0\text{ }^{\circ}\text{C}$  to  $+50\text{ }^{\circ}\text{C}$ , unless otherwise noted)

Parameter	Symbol	Minimum	Typical	Maximum	Units
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 Electrical Interface** ( $T_A = 0\text{ }^{\circ}\text{C}$  to  $+50\text{ }^{\circ}\text{C}$ , unless otherwise noted)

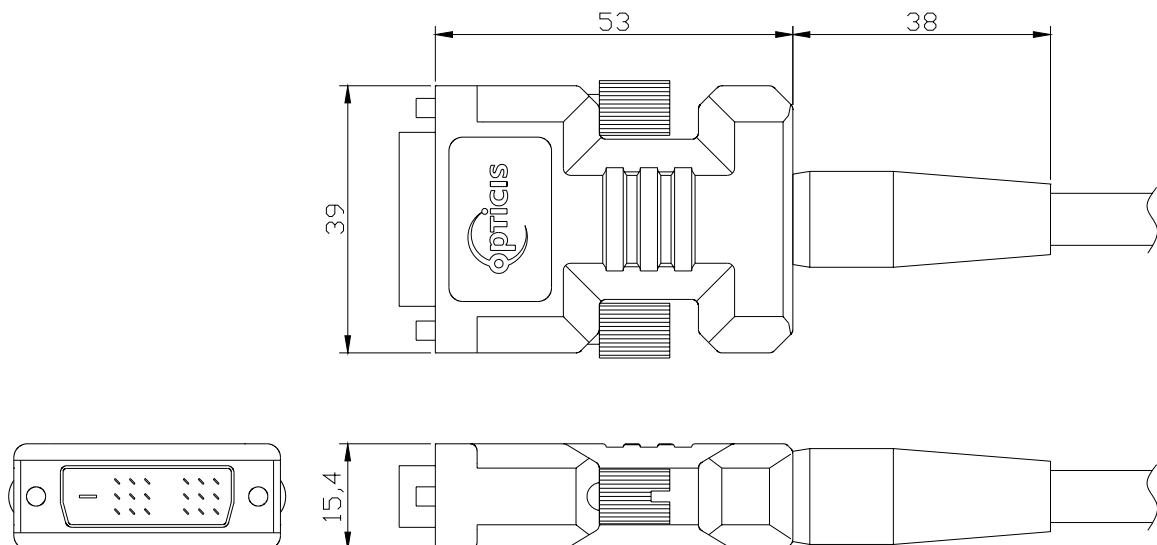
Parameter	Symbol	Minimum	Typical	Maximum	Units
Single-Ended High Level Output Voltage	$GV_{OH}$	$GV_{CC} - 0.1$	$GV_{CC}$	$GV_{CC} + 0.01$	V
Single-Ended Low Level Input Voltage	$GV_{OL}$	$GV_{CC} - 0.4$	-	$GV_{CC} - 0.25$	V
Single-Ended Output Swing Voltage ( with $50\ \Omega$ Load)	$GV_{OSWING}$	0.2	-	0.4	V

**Specifications of Fibre-Optic Cables**

Parameter	Value	Parameter	Value
Core Diameter	200um (HPCF), 62.5um (MMGOF)	Cladding Diameter (only for HPCF)	225um
Buffer Diameter	0.5mm (HPCF), 0.25mm (MMGOF)	Outside Diameter	7.6mm
Proof Test Level	0.53GPa		

**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

## 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=4	0	<b>Note:</b> Visual Test on the Display
<b>Storage Test</b>	Low Temperature	* T <sub>s</sub> = -30 °C	96 HR	n=2	0	1. TS: Storage Temperature
	High Temperature	* T <sub>s</sub> = 70 °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=2	0	
<b>Mechanical Test</b>	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 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**

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 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	Digital Display Channel. Latest specification is DDC2B.
DVI-D	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.
TMDS	Transmission Minimized Differential Signalling is the Silicon Image Inc. protocol for the digital signals.
VCSEL	Vertical Cavity Surface Emitting Laser diode. The receiver diode is the PIN-Photo Diode. These components are designed and manufactured by Opticis.
VESA	Video Electronics Standards Association.