

# DATA SHEET

## 2-Fiber Detachable Dual Link DVI module, DDFX-100

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## **2-Fiber Detachable Dual Link DVI module, DDFX-100**

### **Description**

Optical graphic extension module consists of transmitter module and receiver module, each of which has two (2) LC connectors and a 24-pins DVI-D plug. Users could decide extension length at their discretion by choosing the length of fiber-optic cables with LC ferrules at the ends. It offers two (2) graphic TMDS signals to be extensible up to the limits of modal bandwidth of selected multi-mode glass fiber(50/125 um or 62.5/125um).

The module has a capability to transmit up to WQXGA (2560x1600) at 60Hz or WQUXGA (3840x2400) at 33Hz graphic signals with 60Hz refresh rate using leading-edge OPTICIS fiber-optic component that transmits seven (7) data channels over two (2) multi-mode fibers. 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 DDFX-100 more easy and flexible at any variable resolution display systems.

The modules are constituted of three parts as follows;

- One (1) transmitter converting electrical to optical signals, model name: DDFX-100-T
- One (1) receiver converting optical to electrical signals, model name: DDFX-100-R
- Two (2) AC Adaptors to 110V-240V with DC 5V 1A outlet

### **Features**

- ◆ Extends all VESA resolution up to WQXGA (2560x1600) at 60Hz or WQUXGA (3840x2400) at 33Hz DVI data up to 500 meters (1,640ft) over two (2) multi-mode fibers
- ◆ Detachable feature with a duplex LC connector for 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
- ◆ The modules are compact enough to directly plug to graphic sources and displays by adopting DVI-plugs
- ◆ Includes two (2) +5V DC power adapters for the transmitter and receiver
- ◆ Certifications: FCC / CE, Class 1 Laser Eye Safety
- ◆ Data security with negligible RFI/EMI emissions and loss of video quality due to no copper conductor present

## Applications

- ◆ Medical imaging system
- ◆ Video wall system
- ◆ Digital signage
- ◆ Military / Aerospace
- ◆ Broadcast
- ◆ Conference room / Education

## Technical Specifications

### - General Specifications

	Parameter	Specifications
Components	Laser Diodes in Tx Module	Multi-mode VCSEL (Vertical Cavity Surface Emitting Laser)
	Photo Diodes in Rx Module	PIN-PD
Electrical	Input and Output Signals	TMD5 Level (complying with DVI1.0)
	Data Transfer Rate (Graphic Data)	Max. 2.25Gbps
	Total Jitter at the end of Rx output	Max. 309 ps
	Skew inter-channels	Max. 6ns
Optical	Link Power Budget	Min 1dB
Mechanical	Module dimension (WDH)	39 x 72 x 15mm
Connect	Optical Connector	Duplex LC connectors
	Electric Connector Type from Systems 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>	-	+ 7.0	V
Operating Temperature	T <sub>op</sub>	0	50	°C
Storage Temperature	T <sub>s</sub>	- 30	+ 70	°C
Operating Humidity	H <sub>s</sub>	10	85	%RH
Storage Relative Humidity	H <sub>s</sub>	10	95	%RH

- **Operating Conditions**  
**Transmitter module (E-to-O converter): DDFX-100-TX**

	Parameter	Symbol	Minimum	Typical	Maximum	Units
Power Supply	Supply Voltage	V <sub>CC</sub>	4.5	5.0	5.5	V
	Supply Current	I <sub>TCC</sub>	380	400	430	mA
	Power Dissipation	P <sub>TX</sub>	1.7	2.00	2.365	W
	Power Supply Rejection (Note1)	PSR		50		mV <sub>p-p</sub>
TMDS	Data Output Load	R <sub>LD</sub>		50		Ω
	Graphic Supply Voltage (Note2)	GV <sub>CC</sub>	+ 3.1	+ 3.3	+ 3.5	V
	Single-Ended High Level Input Voltage	GV <sub>IH</sub>	GV <sub>CC</sub> - 0.01	GV <sub>CC</sub>	GV <sub>CC</sub> + 0.01	V
	Single-Ended Low Level Input Voltage	GV <sub>IL</sub>	GV <sub>CC</sub> - 0.6	-	GV <sub>CC</sub> - 0.4	V
	Single-Ended Input Swing Voltage	GV <sub>ISWING</sub>	0.4	-	0.6	V
Optical Link (Note3)	Output Optical Power	P <sub>o</sub>			1	dBm
	Wavelength	λ	846.4		993.6	nm
	Spectral width in RMS	Δλ			3	nm
	Relative Intensity of Noise (Note4)	RIN		-20		dB/Hz
	Extinction Ratio	Ext	4			dB
	Rising/Falling Time	T <sub>rise</sub> /T <sub>fall</sub>			260	ps
	Jitter in p-p value (Note5)	T <sub>jitter</sub>			260	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): DDFX-100-RX**

	Parameter	Symbol	Minimum	Typical	Maximum	Units
Power Supply	Supply Voltage	V <sub>CC</sub>	4.5	5.0	5.5	V
	Supply Current	I <sub>RCC</sub>	300	320	350	mA
	Power Dissipation	P <sub>RX</sub>	1.35	1.6	1.925	W
	Power Supply Rejection (Note6)	PSR		50		mV <sub>p-p</sub>
TMDS	Data Input Load	R <sub>LD</sub>		50		Ω
	Graphic Supply Voltage (Note7)	GV <sub>CC</sub>	+ 3.1	+ 3.3	+ 3.5	V
	Single-Ended Output Swing Voltage (Note8)	GV <sub>ISWING</sub>	0.2	-	0.4	V
Optical Link (Note9)	Receiving Optical Power	P <sub>o</sub>	-11		1	dBm
	Receiving Wavelength	λ	846.4		993.6	nm
	Signal_Detect Good	SD <sub>g</sub>			-15	dBm
	Signal_Detect Fail	SD <sub>f</sub>	-23			dBm
	Link Power Budget	P <sub>bgt</sub>	1			dB
	Total Jitter (note 10)	TR <sub>jitter</sub>			309	ps

Note6. 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.

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		50µm Multi-mode Graded Index Glass Fiber
Modal Bandwidth	$\lambda = 850\text{nm}$	Min. 500 MHz km
Fiber Cable Attenuation	$\lambda = 850\text{nm}$	Max. 2.5dB/km
Extension Distance		10 – 1650ft (500 meters)
No. of Ferrules	Duplex LC	2 ferrule
Skew		Max. 0.4ns
Insertion Attenuation		Max. 0.5dB
Total Optical Attenuation	In 330 ft (100 meter) extension	Max. 1.5dB

**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 DDFX-100-TR more easy and flexible at any variable resolution display systems.

**- Power Protection Circuit Mode in Transmitter Module**

The transmitter (Tx) module of DDFX-100-TR is designed for power protection circuit from conflict of power supply between the external AC/DC power adapter and your DVI source by #14 pin.

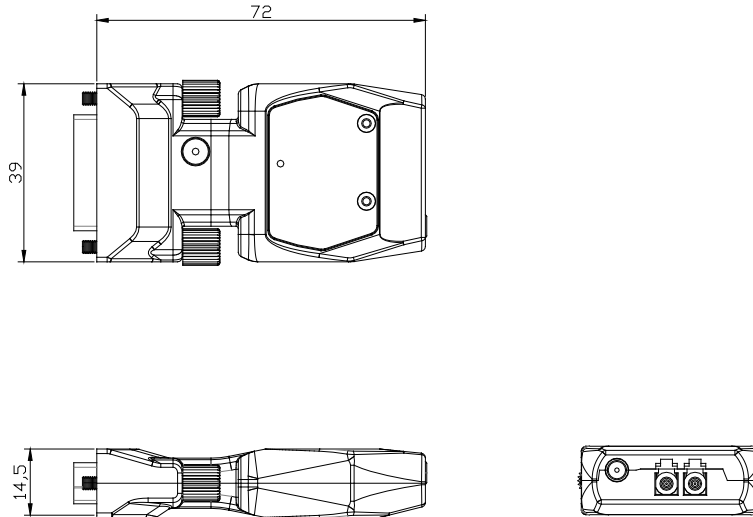
**We strongly recommend to use external AC/DC adapter for Transmitter (Tx) for stable power supplying. In case of Receiver (Rx), power should be supplied by AC/DC adapter due to no internal power supplying from the displays.**

**- Signal Detect Mode in Receiver Module**

It offers optical signal monitoring LED when optical input power is lower than as specified in a certain case, for instance, losing optical connectors.

## Drawing

Dimension [mm]

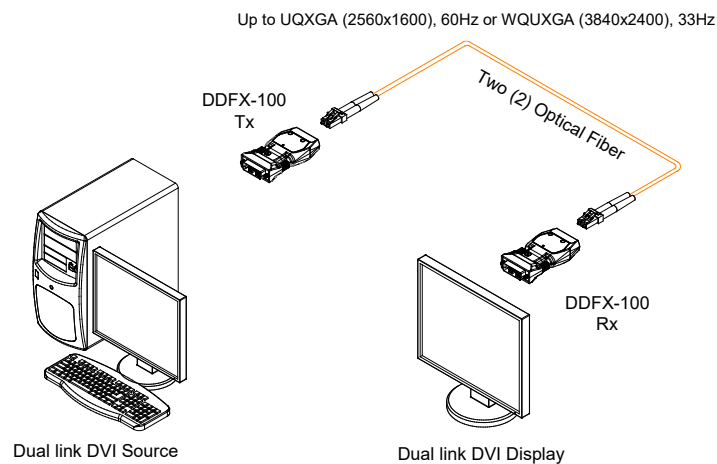


Note: The transmitter, DDFX-100-T and the receiver, DDFX-100-R have the same mechanical dimensions.

## Fiber Connection

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

### Connection Diagram



## 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 <sup>(Note11)</sup>
		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

Note11) 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 DDFX-100 transmitter.