

DATA SHEET

Optical Dual Link DVI Module

M1-3R2VI-DU

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Optical DVI Dual Link Extension Module

- Fiber Detachable Connection System of DVI Dual Link -

Description

The M1-3R2VI-DU DVI Module is a new member of the Opticis family of products that stretches your DVI connectivity. It offers a fiber-optic long-distance extension of dual link DVI connectors. DDC connection is implemented over a CAT5e cable with RJ-45C.

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 dual link DVI-D plugs, being able to connect PCs (Media Receiver) and displays (Monitor or HDTV) by dual link DVI-D copper cables respectively. Two (2) duplex LC patch cord fiber cables enable to transmit graphic data, 7 channels including a clock.

The module also provides self-EDID programming feature that makes pure optical interconnection realized. It makes installation of M1-3R2VI-DU much easier and more flexible at any displays of various resolution types. The module extends DVI dual link data of WQXGA (2,560x1,600) resolution up to 2km (6, 600 feet) with virtual DDC.

The shipping group is shown as follows;

- 1) 1ea x DVI Dual link Transmitter Module
- 2) 1ea x DVI Dual link Receiver Module
- 3) 2ea x DVI Dual link Copper Cable (1.8m)
- 4) 1ea x 24V Power Supply Adapter (AC 85-264V, 50/60Hz)
- 5) 1ea x AC Cord (US Type or EU type)
- 6) 1ea x User Manual
- 7) Option : 2 duplex LC Patch Cord Cable, CAT5e Cable, One more +24V Power Adapter for virtual DDC

Features

- ◆ Supports up to 2,560x1,600 resolution at 60Hz refresh rate.
- ◆ Extends up to 100 m (328 feet) with DDC2B.
2 km (6,600 feet) with virtual DDC.
- ◆ Fiber-optic cables with four (4) LC or two (2) duplex LC fiber connectors are required to transmit Red, Green, and Blue, three (3) channels for each link and one clock.
- ◆ Offers DVI single link DVI connection through two (2) LC or one (1) duplex LC LC fibers.
- ◆ Provides 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.
- ◆ Applicable to both single and multi-mode fiber.
- ◆ Light weight detachable cables with secure connectors for fiber and copper.
- ◆ No software to install - plug & play simplicity.
- ◆ Low EMI/RFI emissions and inherent fiber data security.
- ◆ Complies with FDA/CDRH and IEC 60825-1 Class 1 Laser Eye Safety.
- ◆ Adopts only an external power supply, +24V to supply both modules over CAT5e cable.
- ◆ Uses 1310/1550nm single-mode light sources and equivalent photo detectors.

Applications

- ◆ Power Mac G5 with graphic cards supporting Dual Link DVI and 30" Cinema Display
- ◆ Medical, military, aerospace, factory, and traffic control integrated digital display systems
- ◆ Digital TFT-LCD and plasma flat panel displays and projectors for conference room, auditorium, airports, stadium and kiosk systems.
- ◆ Digital Home Theatre Systems

Technical Specifications

- General Specifications

| | Parameter | Specifications |
|------------|--|---|
| Components | Laser Diodes in Tx Module | 1310nm/1550nm BIDI Transmitter with FP-LD |
| | Photo Diodes in Rx Module | 1310nm/1550nm BIDI receiver with GaAs PIN-PD |
| Electrical | Input and Output Signals | TMD5 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 |
| Mechanical | Module dimension (mm) | 111.8WX31HX215.9L |
| Connect | Optical Connector | 2 Duplex LC connectors |
| | Electric Connector Type from Modules and to Displays | 24 pin DVI-D plug |
| | Recommended Fiber | 62.5/125 or 50/125 um Multi-mode Glass Fiber 9/125um Single-mode Glass Fiber |

Note*: some plastic couplers to clamp two LC connectors could not fit in.

- Absolute Maximum Ratings

| Parameter | Symbol | Minimum | Maximum | Units |
|--|------------------|---------|---------|---------------|
| Storage Temperature | T _{stg} | - 10 | + 85 | °C |
| Supply Voltage | V _{CC} | 10 | 16 | V |
| Transmitter Differential Input Voltage | V _d | - | 1 | V |
| Relative Humidity | RH | 5 | 85 | % |
| Lead Soldering Temperature & Time | - | - | - | 260°C, 10 sec |

Note*: Under the condition of No drops of dew

- 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} | + 22 | + 24 | + 26 | 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} | 22 | 24 | 26 | V | |
| Supply Current | TX | I _{TCC} | 180 | 220 | 270 | mA |
| | RX | I _{RCC} | 270 | 330 | 380 | mA |
| Power Dissipation | TX | P _{TX} | 3.8 | 5.3 | 7.2 | W |
| | RX | P _{RX} | 5.8 | 7.9 | 10.0 | W |

- **Optical & Electrical Characteristics** ($T_{op} = 25^{\circ}\text{C}$)

| Parameters | | Symbol | Condition | Unit | Min. | Typ. | Max. | Remark |
|--|--------------|--------------|---|-------|--------------|----------------|--------------|--|
| Data Bit Rate | 1310 Tx | | PRBS 2^7-1 ,NRZ | Mbps | | 1250 | 1650 | |
| | 1550 Rx | | | | | 155.52 | | |
| | 1550 Tx | | PRBS 2^7-1 ,NRZ | Mbps | | 155.52 | | |
| | 1310 Rx | | | | | 1250 | 1650 | |
| Fiber Length 9 μm core SMF | | | 10^{-10} BER, 155Mbps /1.25Gbps | km | 2 | | | |
| TRANSMITTER | | | | | | | | |
| Average Launched Power | | P_{OUT} | $I_f = I_{BIAS} + I_{mod}/2$ | dBm | -10 | | 0 | |
| Extinction Ratio | | ER | | dB | 5 | | | |
| Center Wavelength | | λ_c | CW, @ P_{OUT} | nm | 1260 1480 | 1310 1550 | 1360 1580 | @1.31 μm @1.55 μm |
| Spectral Width | | | RMS Width | nm | | | 2.1 | |
| RIN | | | | dB/Hz | | | -120 | |
| Data Input Differential Voltage | | V_{IN} | | mV | 200 | | 1600 | |
| Optical Rise/Fall Time | | t_r/t_f | 20 – 80% | nsec | | | 0.26 2.0 | |
| RECEIVER | | | | | | | | |
| Maximum Input Power | | P_{in} | | dBm | 0 | | | |
| Sensitivity | | P_s | | dBm | | | -17 | 155M Rx 1.65G 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 | | P_D | | dBm | | $P_{IN,MIN-3}$ | | |
| Increasing light input | | P_A | | dBm | | $P_{IN,MIN-2}$ | | |
| LOS Hysteresis | | | | dB | 1 | | | |

- **TMDS Characteristics**

| | Parameter | Symbol | Minimum | Typical | Maximum | Units |
|---------------------|---|---------------|------------------|-----------|------------------|----------|
| Transmitter 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 TMDS | Data Input Load | R_{LD} | | 50 | | Ω |
| | Graphic Supply Voltage (Note3) | GV_{CC} | + 3.1 | + 3.3 | + 3.5 | V |
| | Single-Ended Output Swing Voltage (Note4) | GV_{ISWING} | 0.4 | - | 0.6 | V |

Note2. Graphic Supply Voltage is regulated reference voltage for signal processing in modules

Note3. Graphic Supply Voltage is regulated reference voltage for signal processing in modules

Note4. TMDS outputs are coupled in AC

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 M1-3R2VI-DU more easy and flexible at any variable resolution display systems.

- 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.

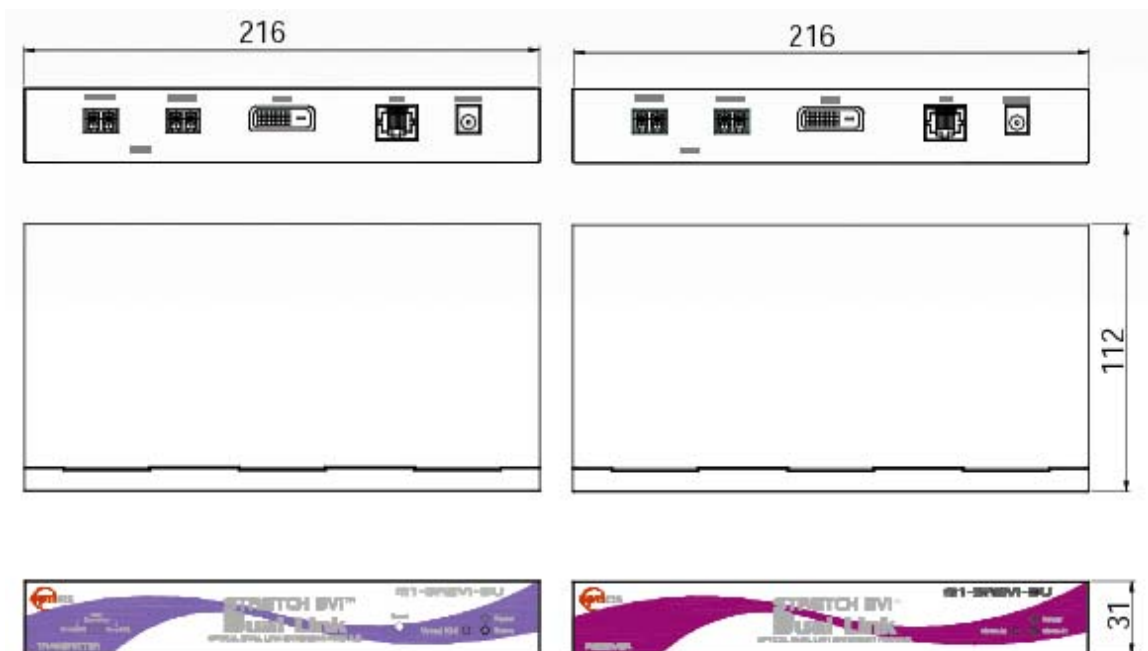
- Signal Detect Mode in Receiver Module

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.

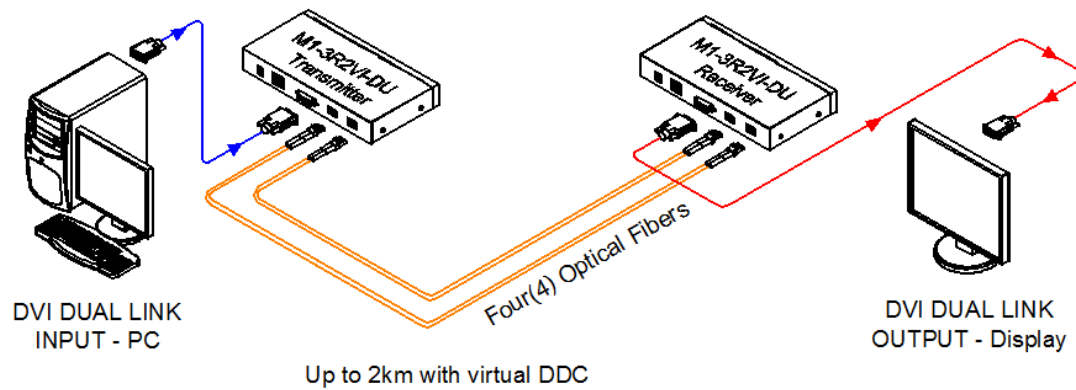
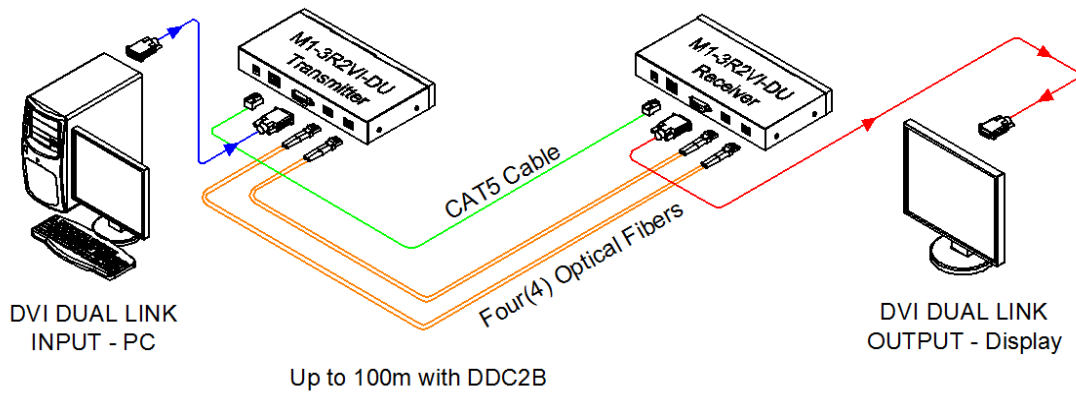
Drawing of Modules

Dimension [mm]

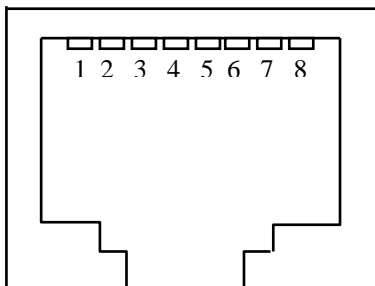
Note: The transmitter, M1-3R2VI-DU-T and the receiver, M1-3R2VI-DU-R have the same mechanical dimensions.



Drawing of Cable Connections



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 | Power GND | Main power return ground |
| 8 | Power GND | Main power return ground |

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 | 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 0/5 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 Negative |
| 24 | CLK+ | TMDS Clock Channel Positive |

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 M1-3R2VI-DU)

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 (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 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 |