

DATA SHEET

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Optical Graphic Extension Module

- Point-to-point fibre cables -

Description

Digital graphic interconnection enables data transmission of high-quality and cost effectiveness of integrated display systems. In addition, optical technology for transmission makes it simple to extend digital graphic data above extension limit of copper wires and free from cable EMI/RFI.

It consists of a transmitter and a receiver, which are connected by bundled fiber-optic cables and have male DVI connectors at both other ends. For graphic data transmission, a transmitter has VCSEL array inside and a receiver Pin-PD array inside. For DDC interconnection, optical bi-directional technology is applied.

It can simply extend over the limits of copper wire extension, without any distribution amplifier or repeater. Especially, it offers lots of benefits to simplify the systems in applications adopting digital displays like PDP panels, TFT panels, beam projectors, and color LED signboards.

Features

Extend digital graphic/video signals above distance extensible in copper wires

- Up to 500 meter (1640 feet) at maximum, DDC clock speed could affect
- Support various connection lengths

Employ bundled cable of 8 strand multimode fibers of 50/125 or 60/125um

- Riser jacket of non-flammable PVC

Support two resolutions according to models as follows;

- **AP1-100** supports up to SXGA resolution at 75Hz refresh rate with 1 pixel/clock mode
- **AP1-100U** supports up to UXGA resolution at 60Hz refresh rate with 1 pixel/clock mode

Comply with DVI standard

- Optical DDC connection supports DDC2B mode
- No DDC support model is option (AP1-101)

Small and light enough to directly plug in graphic controller and display

No require S/W driver to install; just plug and play

Free from cable EMI/RFI

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Applications

- ◆ Digital FPDs, PDPs and projectors for medical appliances, aero, traffic control, factory, and bank
- ◆ Digital FPDs and projectors in conference room and auditorium
- ◆ Kiosk with digital FPDs showing full motion graphic displays from remote systems
- ◆ PDP displays for information in public sites
- ◆ LED signboards in streets and in stadiums

Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Storage Temperature	T_{stg}	- 30	+ 70	°C
Supply Voltage	V_{CC}	- 0.3	+ 6.0	V
Input Voltage	V_{in}	- 0.3	V_{CC}	V
Transmitter Differential Input Voltage	V_d	-	1	V
Relative Humidity	RH	0	80	%
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}	+ 4.5	+ 5.0	+ 5.5	V
Graphic Supply Voltage (Note2)	GV_{CC}	+ 3.1	+ 3.3	+ 3.5	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.

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

Transmitter Electrical Interface ($T_A = 0\text{ °C}$ to $+50\text{ °C}$, 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

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

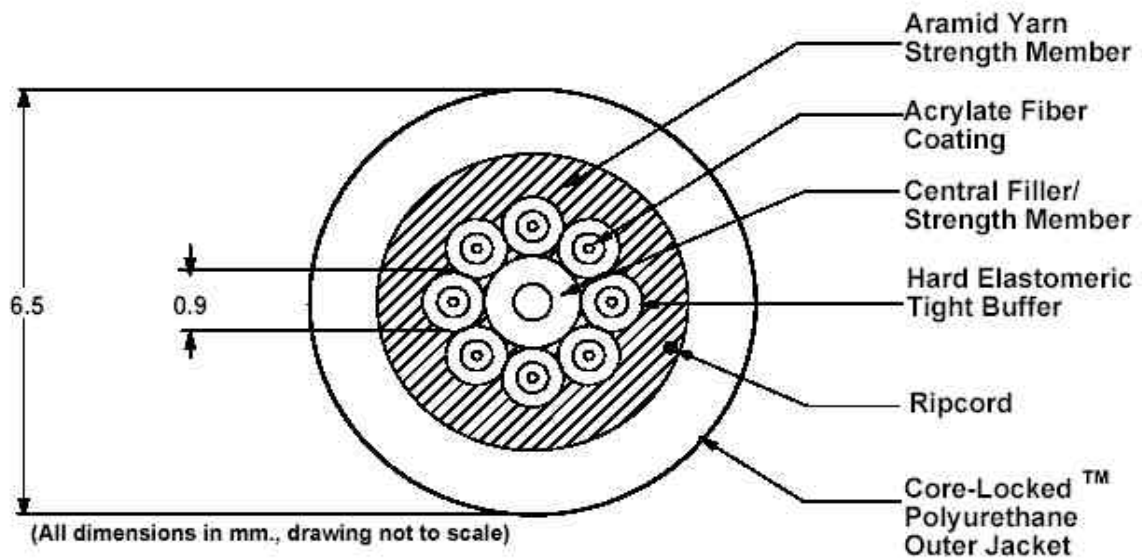
Parameter	Symbol	Minimum	Typical	Maximum	Units
Single-Ended High Level Output Voltage	GV_{OH}	$GV_{CC} - 0.1$	GV_{CC}	$GV_{CC} + 0.01$	V
Single-Ended Low Level Input Voltage	GV_{OL}	$V_{CC} - 0.4$	-	$V_{CC} - 0.25$	V
Single-Ended Output Swing Voltage (with 50 Ω Load)	GV_{OSWING}	0.25	-	0.4	V

Electrical Power Supply Characteristics ($T_A = 0\text{ }^{\circ}\text{C}$ to $+50\text{ }^{\circ}\text{C}$, unless otherwise noted)

Parameter		Symbol	Minimum	Typical	Maximum	Units
Supply Voltage		V_{CC}	4.5	5	5.5	V
Supply Current	TX	I_{TCC}	-	170	200	mA
	RX	I_{RCC}	-	190	250	mA
Power Dissipation	TX	P_{TX}		0.85	1.1	W
	RX	P_{RX}	-	0.95	1.375	W

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Specifications of fiber-optic cables

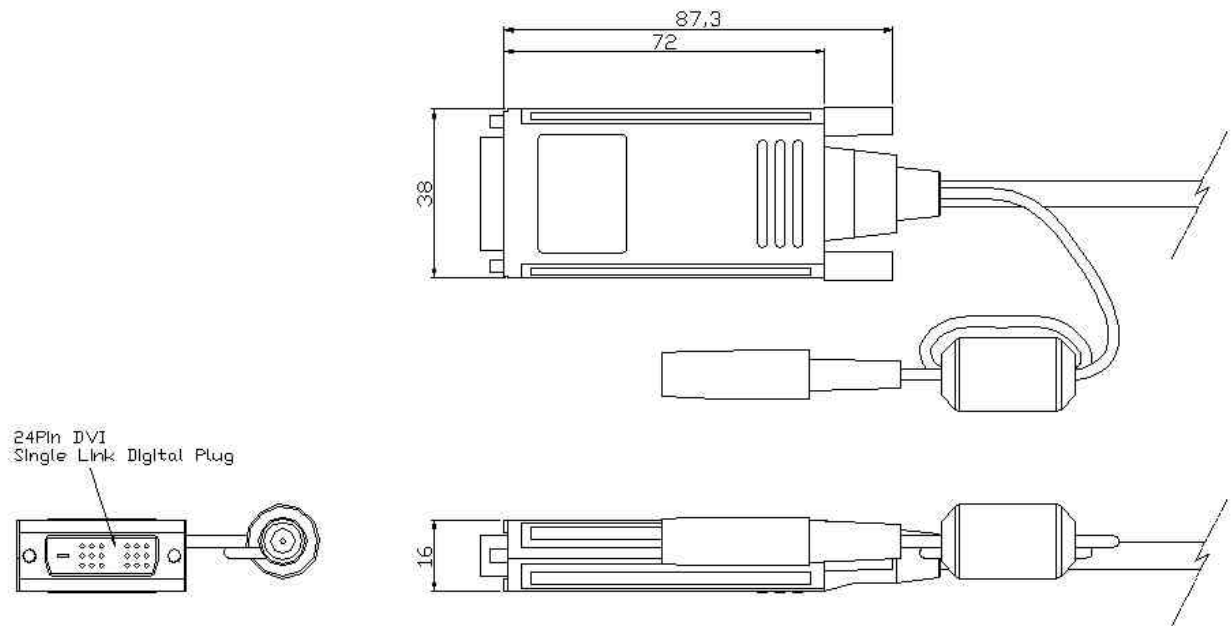


Parameter	Value	Parameter	Value
Core Diameter	50.0um or 62.5um	Cladding Diameter	125um
Primary Coating Diameter (UV cured acrylate)	500um	Secondary Buffer Diameter (hard elastomeric)	900um
Proof Test Level	100kpsi	Cable Weight	38kg/km
Impact Resistance	200 impacts (EIA/TIA-455-25, Military Req.)	Crush Resistance	440N/m (TIA/EIA-455-41, Military Req.)
Installation		Operating	
Max. Tensile Load	1,800N	Max. Tensile Load	600N
Min. Bend Radius	10.4cm	Min. Bend Radius	5.2cm

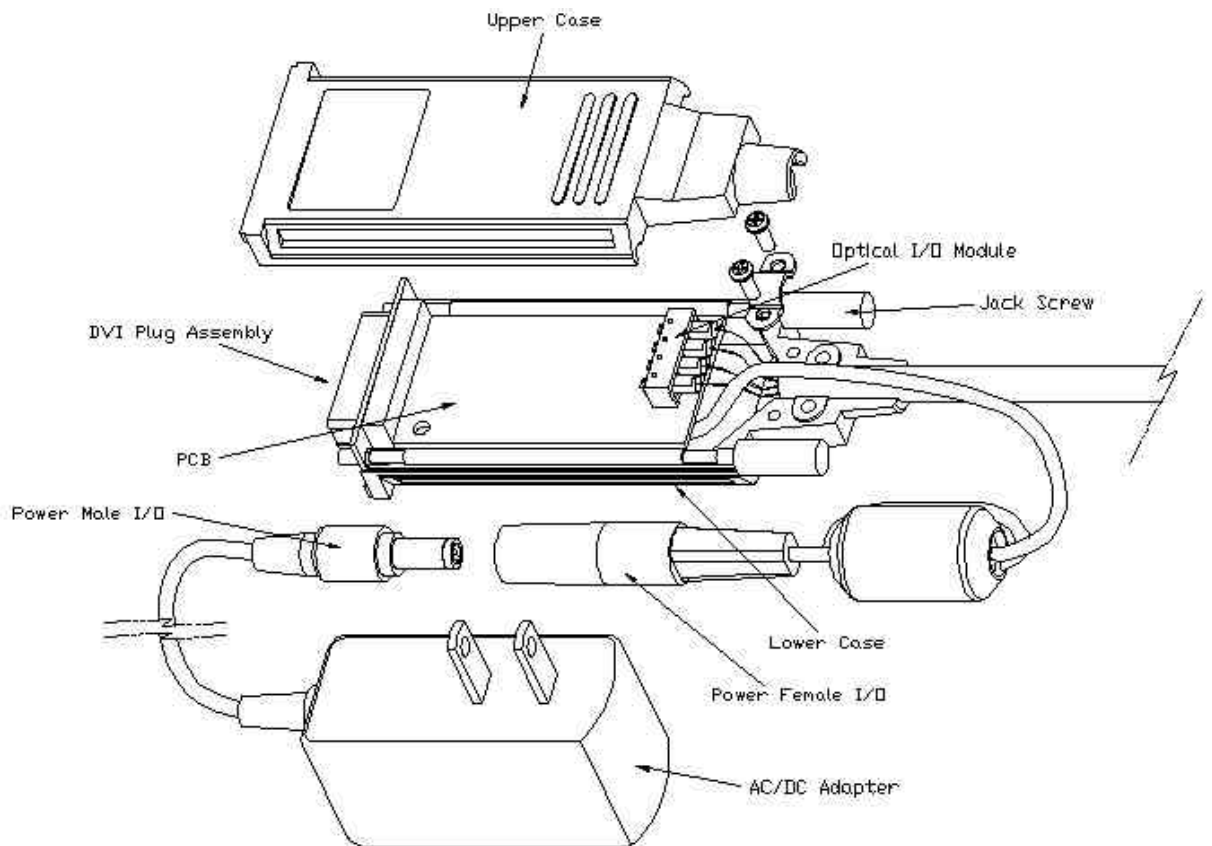
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Drawing of transmitter and receiver modules

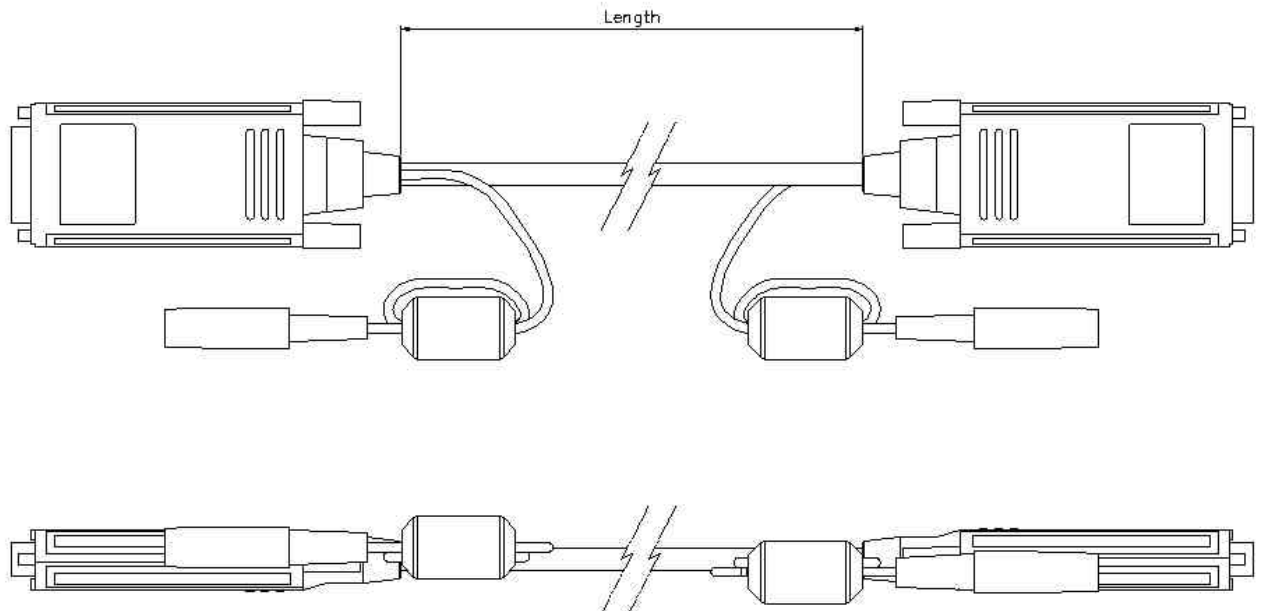
Dimension [mm]



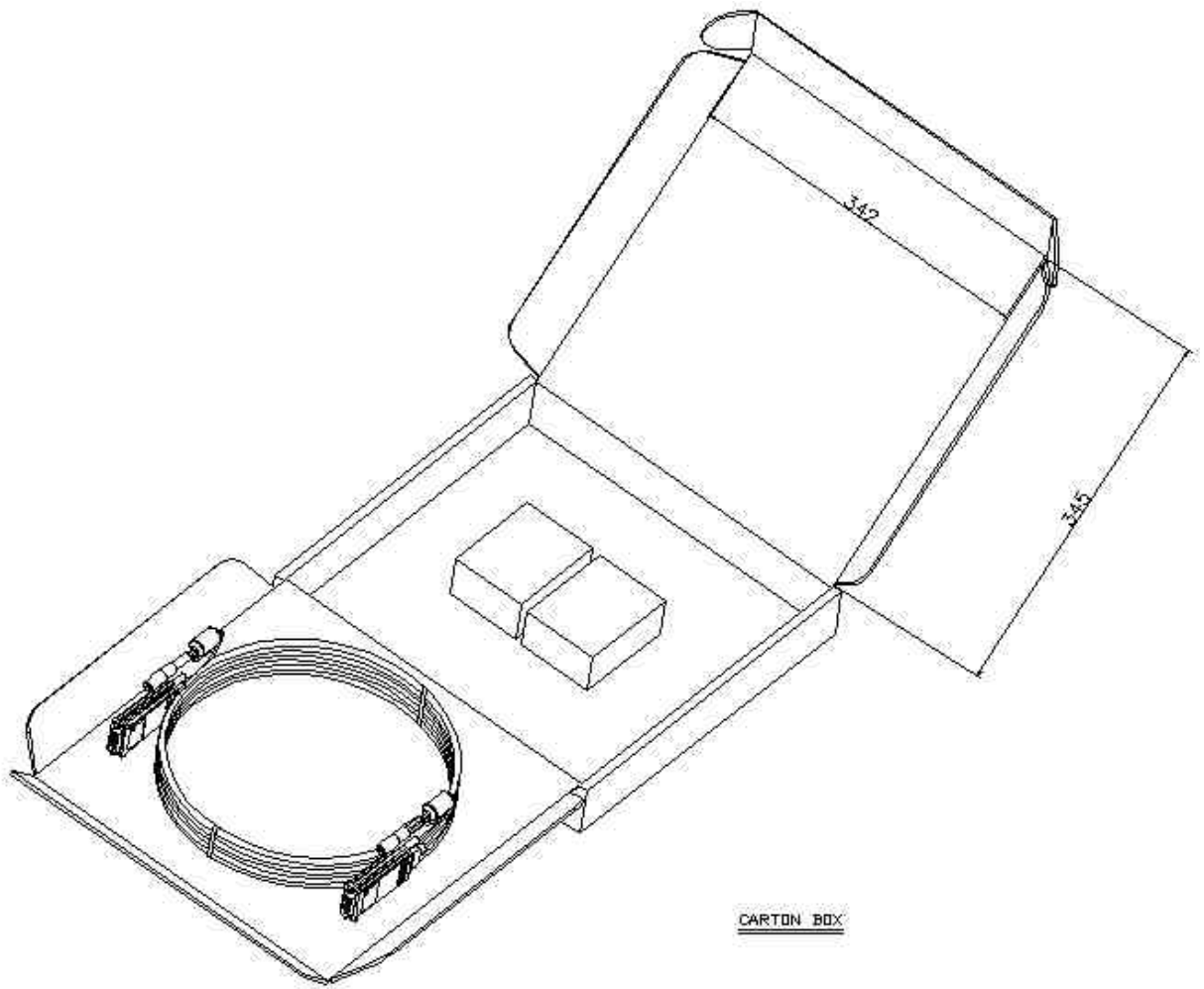
Note: The transmitter and receiver of AP1-100 have the same mechanical dimensions.



ASSEMBLY STRUCTURE



Max.Cable Length : 500m



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Pin Assignment (Transmitter)

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 CLK	DDC Clock Signal
7	DDC DATA	DDC Data Signal
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 1/1 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 Desk Top PC
		In case of using AC-to-DC adapter (Note PC), automatic power switching block protects power collision between Note PC and AC-to-DC adapter. (Note3)
15	GND	Ground
16	Hot Plug Detect	Internally connected with 14 Pin (5 V) through the 5.1 KO resistor.
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

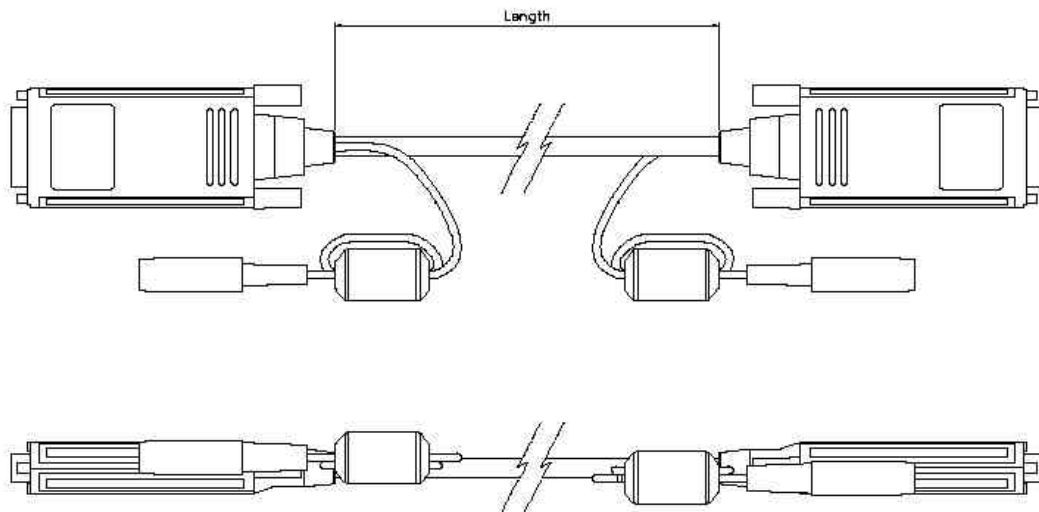
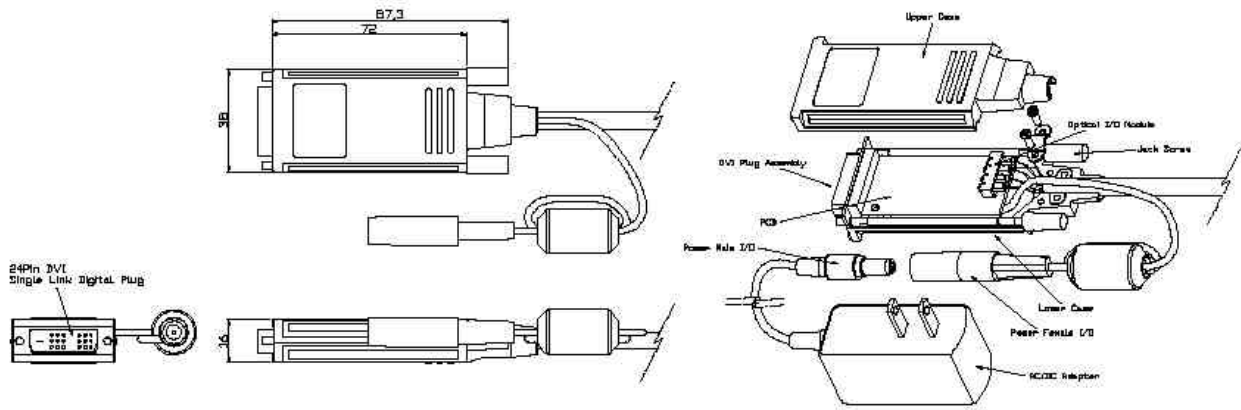
Note3) The AC-to-DC adapter for transmitter is option for Desk Top PC user.
But Note PC user has to use the AC-to-DC adapter because the power of Note PC is not enough to drive AP1-100 transmitter.

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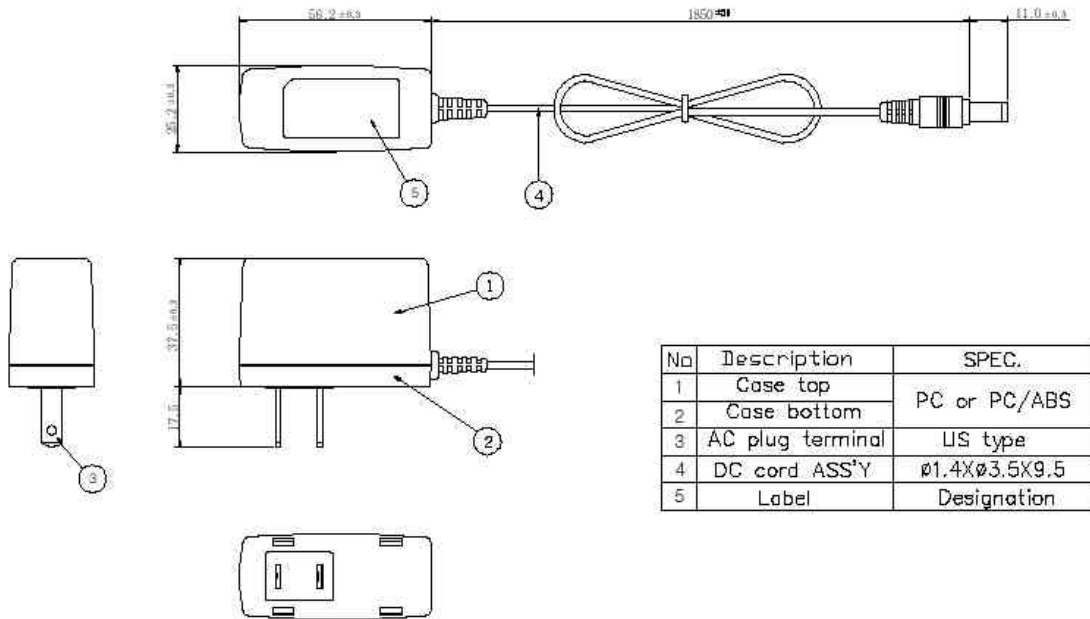
Pin Assignment (Receiver)

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 CLK	DDC Clock Signal
7	DDC DATA	DDC Data Signal
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 1/1 Shield
12	CH3-	TMDS Data Signal Channel 3 Negative
13	CH3+	TMDS Data Signal Channel 3 Positive
14	5 V (Note4)	Main Power for Receiver from AC-to-DC Adapter Also, DDC 5 V (max. driving current is 55 mA according to the DDWG DVI spec.)
15	GND	Ground
16	N.C.	
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

Note4) The AC-to-DC adapter for receiver is default.



Note | Max.Cable Length=500m



No	Description	SPEC.
1	Case top	PC or PC/ABS
2	Case bottom	
3	AC plug terminal	US type
4	DC cord ASS'Y	∅1.4X∅3.5X9.5
5	Label	Designation

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Test Report for AP1-100

Introduction

1. Features

- 1) Digital video signal distribution can be extended up to 500 meter (1640 feet) using multi-mode glass fiber with 400MHz/km modal bandwidth.
- 2) The two modules are connected with 4 fiber-optic cables with LC terminations
- 3) Supports up to SXGA resolution (1280 x 1024) at 75Hz refresh rate
Standard DVI-D module connectors at the ends with no DDC2B support required
- 4) Cables can be installed in conduit with prior to module installation
- 5) Cables are light-weight, zero EMI/RFI emissions,
- 6) No software to install
- 7) Free from cable EMI/RFI

2. Reliability of Modules

Opticis Optical Graphic Extension Module has a unique metallic light enclosure and verified optical fiber that make superior EMC characteristics and achieved good reliability test results.

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

- 1) Mechanical test (Vibration, Shock)
- 2) Temp. & Humidity test
- 3) EMC test (FCC class A verification, CE certification)**

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Reliability Test & Analysis Methodology

1. Test

Heading	Test	Conditions	Duration	Sample Size	Failure	Remarks
Operating Test	Operating at each Temperature (See Note)	* -30~100 °C (Interval:10 °C)	30 Min (Each Temperature)	n =4	0	Note : Visual Test on the Display
Storage Test	Low Temperature	* T _s = -30 °C	96 HR	n=2	0	1. TS : Storage Temperature
	High Temperature	* T _s = 90 °C	96 HR	n=2	0	2. RH : Relative Humidity
	High Humidity High Temperature	* T _s : 85 °C * RH : 85%	96 HR	n=2	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:30~2000 ? * Sweep time: 30 Minutes * 4 Times/Axis	-	n=2	0	

2. Analysis

- 1) Failure base: DVI (Digital Visual Interface Revision 1.0)
- 2) Final qualification date: The 1st quarter of 2002

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EMC Test

1. EMI: Processing in FCC class A and CE standards

2. EMS: Met CE standards

1) EMI

STANDARDS		RESULTS
EN 55 022/98 AND FCC PART 15 SUBPART B	CE (Conducted Emission) RE (Radiated Emission)	Met Class A / PASS
EN 61000-3-2	Harmonics	Met Class A / PASS
EN 61000-3-3	Flickers	Met Class A / PASS

2) EMS (Current Status)

STANDARDS		RESULTS
EN 61 000-4-2:1995	Electrostatic Discharge Immunity (Air: 8 KV, Contact: 1.3 KV)	Met Criterion A / PASS