



**HDMB2**

Optical HDMI Extension system

Customer :

# Specification for

## Model : HDMB2

Revised : October 12, 2015  
Original Release Date : May 15, 2015

# OPHIT

## Revision History

Version Number	Revision Date	Author	Description of Changes
0.1	May 15, 2015	H.S YANG	Initial Version
0.2	September 1, 2015	H.S YANG	Change the case.(HDMB CASE) Change the pcb.
0.3	October 12, 2015	H.S YANG	Change the power consumption

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## 1. General Description

**HDMB2**, This fiber optic cable system let your HDMI compliant display device extend up to 40 meters (131.2 fit) away from host based on HDMI standard without signal degradation by 4K UHD (4096x2160@60Hz) and 3D FHD(1920x1080@60Hz) resolution.

- High speed and long distance transmission by optical system
- Compatible with digital video and audio of HDMI-V2.0 standard
- The use of standard HDMI source-sink connector
- MMF optical fiber + copper hybrid cable structure
- High Bandwidth Cable Assembly (up to 6Gbps Data Rate / Ch)
- E-EDID and Hot Plug channels are transmitted by copper line
- Supports HDCP by DDC channel
- CEC compliant
- SCDC(Scrambling) function is support
- Power operation LED installed
- HEAC is not support
- External power supply is used as the default.
- HDMI-gender or signal conversion equipment does not guarantee

## 2. General Specification

Parameter	Symbol	
	Transmitter	Receiver
Optical Converter	4 ch 850nm Multi-mode VCSEL	4 ch GaAs PIN photo Diode
Input and Output Signal	TMDS Signal HDMI 2.0 standard	
Video Bandwidth	18 Gbps	
Module Size	114 x 25 x 21mm (WxDxH)	73 x 25 x 21mm (WxDxH)
Using electrical connector	HDMI A Type Plug(Male)	HDMI A Type Plug(Male)
Applied Fiber	50/125 $\mu$ m Multi-mode glass-fiber	

### 3. Absolute Maximum Ratings

Parameter	Rating
Storage temperature	-20°C ~ +70°C
Operating temperature	0°C ~ +50°C
Power Supply(DC)	-0.3 ~ +3.3V
Relative Humidity	10 ~ 80 %
Lead solder temperature	260°C, 10 seconds

**NOTICE**

Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operations section for extended periods of time may affect reliability.

## 4. Electrical Specification

### 4.1 Electrical Specification

#### 4.1.1 Transmitter (Source) Module

	Parameter	Symbol	Min	Typ	Max	Units	Condition
P O W E R	Supply Voltage(DC)	Vcc	+4.5	+5	+5.5	V	
	Supply Current	Icc		338		mA	3840x2160@60Hz
	Power Dissipation	Po		1.69		W	
T M D S	Reference voltage for graphic signal	Vref	+3.1	+3.3	+3.5	V	
	Single-ended high level input voltage	VH	Vref-0.01		Vref+0.01	V	
	Single-ended low level input voltage	VL	Vref-0.6		Vref-0.4	V	
	Single-ended input swing voltage	Vswing	0.4		0.6	V	
	Single-ended standby input voltage		Vref-0.01		Vref+0.01	V	
	Data Output Load	RLD		50		Ohms	

Transmitter module of Model HDMB2 includes 4 channel VCSEL(Vertical Surface Emitting Laser Diode) with 850 nm invisible laser radiation.

#### 4.1.2 Receiver(Sink) Module

	Parameter	Symbol	Min	Typ	Max	Units	Condition
P O W E R	Supply Voltage	Vcc	+4.5	+5	+5.5	V	
	Supply Current	Icc		352		mA	3840x2160@60Hz
	Power Dissipation	Po		1.76		W	
T M D S	Reference voltage for graphic signal	Vref	+3.1	+3.3	+3.5	V	
	Single-ended output swing voltage	Voswing	0.4		0.6	V	AC couple
	Data Input Load	RLD		50		Ohms	

## 4.2 Optical Specification

## 4.2.1 Transmitter Characteristics

Parameters	Symbol	Specified			Unit	Test Conditions
		Min.	Typ.	Max.		
Peak Fiber Coupled Optical Output Power	$P_{oc}$		0.500		$\mu W$	If = 6 mA, 50/125 $\mu m$ fiber NA=0.20
Threshold Current	I <sub>th</sub>		1.0	2.0	mA	CW
I <sub>th</sub> Temperature Variation	$\Delta I_{th}$		1.0		mA	T <sub>a</sub> =-10 to 85 oC
Slope Efficiency	H	0.04		0.16	W/A	If = 6 mA
$\eta$ Temperature Variation	$\Delta \eta / \Delta T$		-4000		PPM/ oC	T <sub>a</sub> =-10 to 85 °C at 6 mA
Coupling efficiency	EFCE		75		%	If = 6 mA
Peak Wavelength	$\lambda P$	840	850	860	nm	If = 6 mA
$\lambda P$ Temperature Coefficient	$\Delta \lambda / \Delta T$		0.06		nm/ oC	T <sub>a</sub> =-10 to 85 °C at 6mA
Spectral Bandwidth (RMS)	$\Delta \lambda$		0.4		nm	If = 6 mA
Forward Voltage	V <sub>f</sub>		2.2	2.5	V	If = 6 mA
Breakdown Voltage	V <sub>b</sub>		-10		V	I <sub>r</sub> = 10 $\mu A$
Small Signal Bandwidth	GHz	8				If = 6 mA
Rise and Fall Times	t <sub>R</sub>		40		ps	Prebias Above Threshold, 20%~80%
	t <sub>F</sub>		50			
Relative Intensity Noise	RIN			-130	dB/Hz	10GHz BW, If = 6mA
Series Resistance	RS		80		Ohm	If = 6 mA
Rs Temperature Coefficient	dRs/dT		-2000		PPM/ oC	

Parameters	Symbol	Specified			Unit	Test Conditions
		Min.	Typ.	Max.		
Monitor Current	IPD	0.2		0.7	mA	POC=0.5mW
Dark current	ID			10	nA	Po=0mW, Vr=3V
PD Reverse Voltage	BVRPD	40			V	Po=0mW,Ir=100mA
PD Capacitance	C			50	pF	Vr=0V,Freq=1MHz
				20		Vr=3V,Freq=1MHz



4.2.2 Receiver Characteristics

Parameters	Symbol	Specified			Unit	Test Conditions
		Min.	Typ.	Max.		
Supply Voltage	VCC	3.0	3.3	3.6	V	
Supply Current	ICC	21	28	41	mA	
Sensitivity	S	-12	-14		dBm	BER=1E10-12 PRBS=231-1 at 10.3125Gbps
Optical Overload	OL		0		dBm	
Differential Saturated Output Swing	Vout-,diff	240	280	350	mVp-p	
3dB Bandwidth	fh,-3dB	7	10		GHz	Pave=-12dBm, $\lambda$ =850nm, referenced to 100MHz
Low Frequency Cutoff	LF		30	100	KHz	
Wavelength responsivity	$\lambda$	830	850	860	nm	
Rise/Fall Time	tR/tF			50	ps	Pave=-12dBm, $\lambda$ =850nm
Output Resistance	Ro	30	50	60	$\Omega$	
Monitor Current Slope vs IIN	I MON-P		0.5			
Monitor Current Offset	I OFFSET		10		$\mu$ A	no photo current
Monitor Current linearity	I RANGE	1		1100	$\mu$ A	

## 4.3 Connector Pin Assignment

**Transmitter (Source, Male)**

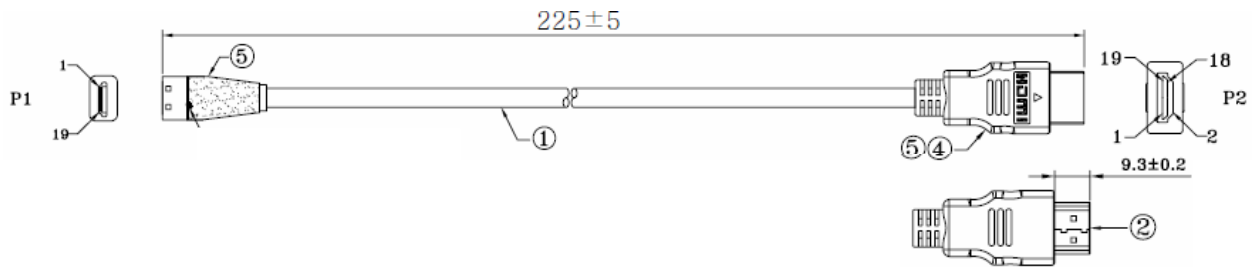
Pin	Signal Assignment	Pin	Signal Assignment
1	T.M.D.S. Data 2+	2	T.M.D.S. Data 2 Shield
3	T.M.D.S. Data 2-	4	T.M.D.S. Data 1+
5	T.M.D.S. Data 1 Shield	6	T.M.D.S. Data 1-
7	T.M.D.S. Data 0+	8	T.M.D.S. Data 0 Shield
9	T.M.D.S. Data 0-	10	T.M.D.S. Clock+
11	T.M.D.S. Clock Shield	12	T.M.D.S. Clock-
13	CEC	14	Reserved (N. C on device)
15	SCL	16	SDA
17	DDC/CEC Ground	18	+5V Power(Input)
19	Hot Plug Detect		

**Receiver (Sink, Female)**

Pin	Signal Assignment	Pin	Signal Assignment
1	T.M.D.S. Data 2+	2	T.M.D.S. Data 2 Shield
3	T.M.D.S. Data 2-	4	T.M.D.S. Data 1+
5	T.M.D.S. Data 1 Shield	6	T.M.D.S. Data 1-
7	T.M.D.S. Data 0+	8	T.M.D.S. Data 0 Shield
9	T.M.D.S. Data 0-	10	T.M.D.S. Clock+
11	T.M.D.S. Clock Shield	12	T.M.D.S. Clock-
13	CEC	14	Reserved (N. C on device)
15	SCL	16	SDA
17	DDC/CEC Ground	18	+5V Power(Output)
19	Hot Plug Detect		



## 5.2.1 Copper Cable Information



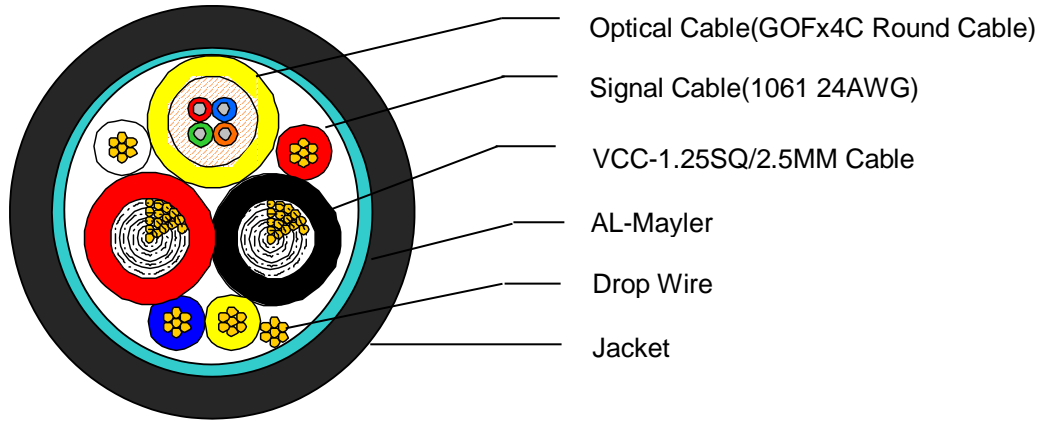
WIRE ARRANGEMENT		
P1	COLOR	P2
1	DRAIN WIRE	2
2	WHITE	1
3	RED	3
4	DRAIN WIRE	5
5	WHITE	4
6	GREEN	6
7	DRAIN WIRE	8
8	WHITE	7
9	BLUE	9
10	DRAIN WIRE	11
11	WHITE	10
12	BROWN	12
13	PINK	17
14	PURPLE	13
15	YELLOW	15
16	ORANGE	16
17	WHITE	14
18	RED	18
19	GRAY	19
CASE	DRAIN WIRE	CASE

ELECTRICAL TEST:

- 1.100% OPEN&SHORT TEST
- 2.CONDUCTOR RESISTANCE: 3 Ohm(MAX)
- 3.INSULATION RESISTANCE: 5M Ohm(MIN)
- 4.HI-POT TEST:AC&DC:300V

5.2.2 Optical Cable Information

The construction of 4 optical fibers and 6 copper wires cable shall be in accordance with Figure 1 and Table 1.

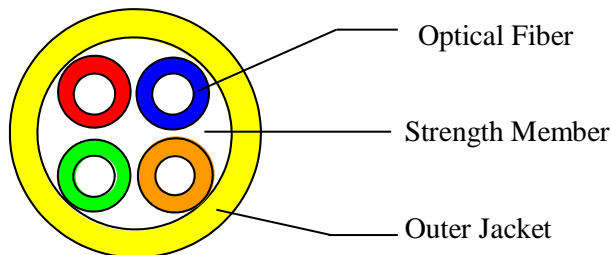


**Figure 1. Cable structure of HDMB2**

**Table 1. Specification of electrical wire for HDMB2 cable**

The Dimension of HDMB2 Cable		
Items	Unit	Specification
DVI Cable Make-up	-	Layer Stranding
Drain Wires (Size/Stranded)	mm(AWG)	-0.203/7 (24)
AL-Mylar Screen Shield	-	A helically
Cable Outer Diameter	mm	7.40±0.20
Jacket Color	-	FR-PVC(Orange, Blue, Black)
Cable Marking	-	If need

The construction of 4 optical fibers and 4 copper wires cable shall be in accordance with Figure 2 and Table 2 and 3.



**Figure 2. Cable structure of GOFx4C Round Cable**


**Table 2. Fiber Cable Construction**

Item		Description
Optical Fiber	Number	4
	Structure	Figure 1
Strength Member		Aramid Yarn
Outer Jacket	Material	FR-PVC(Yellow)
	Approx.Thickness	1.6mm
Nominal Outside Diameter		$\phi 4.0 \pm 0.4 \text{mm}$
Approximate Net Weight		10kg/km
Cable Identification		OPTICAL HDMB CABLE

**Table 3. Fiber Cable Characteristics**

Item	spec.	unit	Condition
Storage Temperature	-40 ~ 70	°C	Spooled
Operational Test	-20 ~ 70	°C	-
Max. Tensile Load	245	N	By careless handling(short term)
Min. Radius Bend	75	mm	By careless handling(short term)
	125		After installing(long term)
Crush Resistance	490	N/50mm	By careless handling(short term)

**6. RoHS**



## Declaration of RoHS Compliance

**DIRECTIVE 2002/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL OF 27. January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment**

Product Name : HDMB2

Hereby we guarantee that we do not intentionally use the substances described below and based on third party chemical analysis the thresholds of the substances as indicated are not exceeded for our products.

Banned Substances by RoHS Directive 2011/65/EU, EN50581:2012

Substance	RoHS Limity by Weight	RoHS Limity by % (PPM)
Lead (Pb)	1000mg/kg	0.1% (1000 PPM)
Mercury (Hg)	1000mg/kg	0.1% (1000 PPM)
Hexavalent Chromium (CR VI)	1000mg/kg	0.1% (1000 PPM)
Polybrominated Biphenyls (PBB)	1000mg/kg	0.1% (1000 PPM)
Polybrominated Diphenyl Ethers (PBDE)	1000mg/kg	0.1% (1000 PPM)
Cadmium (CD)	100mg/kg	0.01% (100 PPM)

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