

# PRODUCT DATA SHEET

## HDMB2

*Optical HDMI Extension System*



## Revision History

Version Number	Revision Date	Page	Description of Changes
1.0	Jul.13, 2016	ALL	Initial Version(Production Version)
1.1	Oct .10, 2019	ALL	Renewal Specification

### PROPRIETARY NOTE

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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 (3840x2160@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)
- 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	74 x 24 x 19mm (W×D×H)	54 x 24 x 19mm (W×D×H)
Using electrical connector	HDMI A Type Plug(Male)	HDMI A Type Plug(Female)
Applied Fiber	50/125 $\mu$ m Multi-mode glass-fiber	

### 3. Absolute Maximum Ratings

Parameter	Rating
Storage temperature	-20°C ~ +70°C Non-Condensing
Operating temperature	0°C ~ +50°C Non-Condensing
Transportation temperature	-20°C ~ +70°C Non-Condensing
Power Supply	-0.3 ~ 5.5 V
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	+4.7	+5	+5.3	V	
	Supply Current	Icc		0.33	0.37	A	3840x2160@60Hz
	Power Dissipation	Po		1.65	1.96	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	+4.7	+5	+5.3	V	
	Supply Current	Icc		0.45	0.49	m	3840x2160@60Hz
	Power Dissipation	Po		2.20	2.59	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	

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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		$\mu W$	$I_f = 6 \text{ mA}, 50/125 \mu m$ fiber NA=0.20
Threshold Current	$I_{th}$		1.0	2.0	mA	CW
$I_{th}$ Temperature Variation	$\Delta I_{th}$		1.0		mA	$T_a = -10 \text{ to } 85 \text{ } ^\circ C$
Slope Efficiency	$H$	0.04		0.16	W/A	$I_f = 6 \text{ mA}$
$\eta$ Temperature Variation	$\Delta \eta / \Delta T$		-4000		PPM/ $^\circ C$	$T_a = -10 \text{ to } 85 \text{ } ^\circ C$ at 6 mA
Coupling efficiency	EFCE		75		%	$I_f = 6 \text{ mA}$
Peak Wavelength	$\lambda_P$	840	850	860	nm	$I_f = 6 \text{ mA}$
$\lambda_P$ Temperature Coefficient	$\Delta \lambda / \Delta T$		0.06		nm/ $^\circ C$	$T_a = -10 \text{ to } 85 \text{ } ^\circ C$ at 6mA
Spectral Bandwidth (RMS)	$\Delta \lambda$		0.4		nm	$I_f = 6 \text{ mA}$
Forward Voltage	$V_f$		2.2	2.5	V	$I_f = 6 \text{ mA}$
Breakdown Voltage	$V_b$		-10		V	$I_r = 10 \mu A$
Small Signal Bandwidth	GHz	8				$I_f = 6 \text{ mA}$
Rise and Fall Times	tR		40		ps	Prebias Above Threshold, 20%~80%
	tF		50			
Relative Intensity Noise	RIN			-130	dB/Hz	10GHz BW, $I_f = 6 \text{ mA}$
Series Resistance	RS		80		Ohm	$I_f = 6 \text{ mA}$
Rs Temperature Coefficient	dRs/dT		-2000		PPM/ $^\circ C$	

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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)

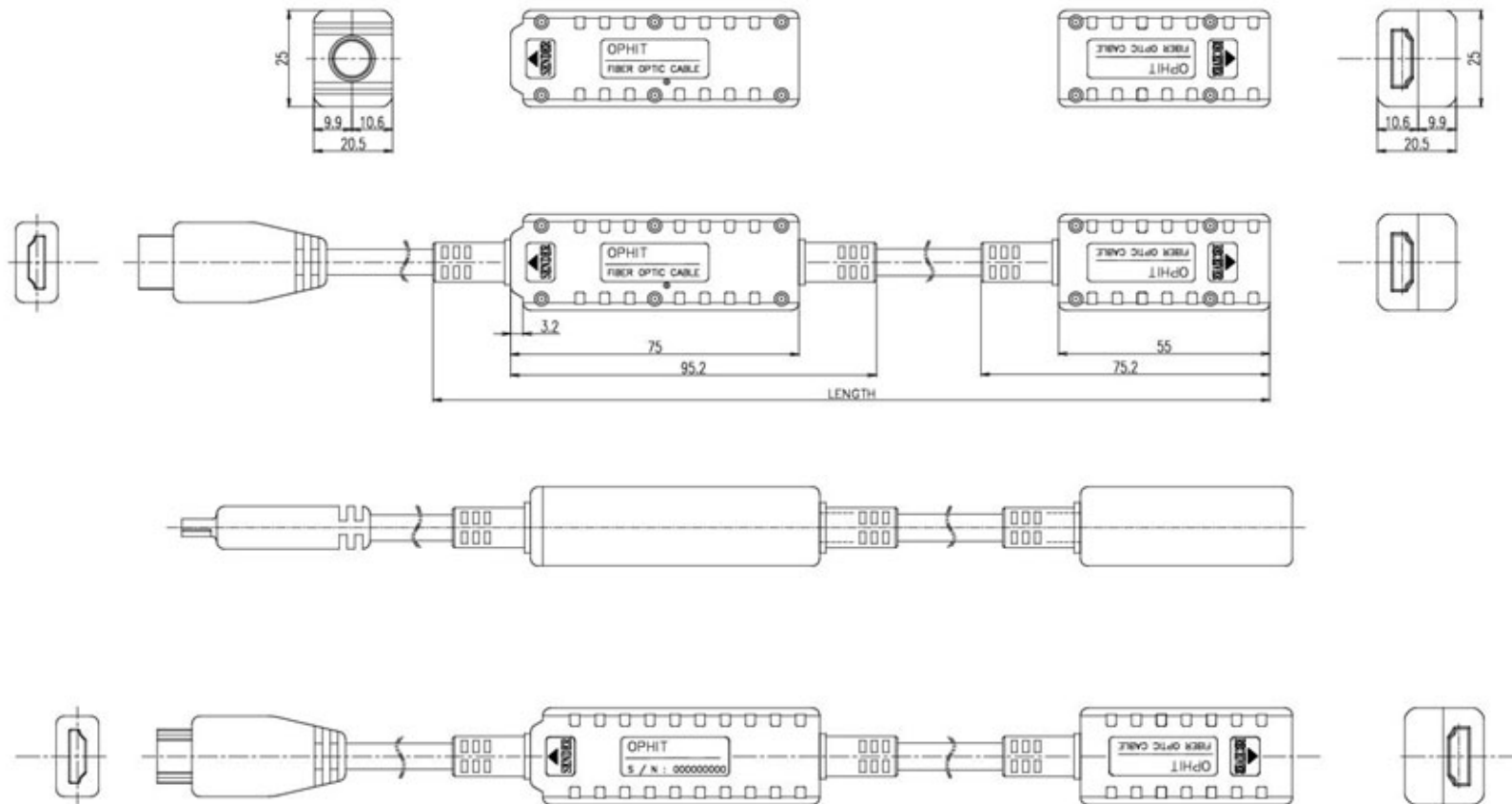
Pin	Signal Assignment	Pin	Signal Assignment
1	T.M.D.S. Data 2+	2	T.M.D.S. Data 2 Shield
3	T.M.D.S. Data 2-	4	T.M.D.S. Data 1+
5	T.M.D.S. Data 1 Shield	6	T.M.D.S. Data 1-
7	T.M.D.S. Data 0+	8	T.M.D.S. Data 0 Shield
9	T.M.D.S. Data 0-	10	T.M.D.S. Clock+
11	T.M.D.S. Clock Shield	12	T.M.D.S. Clock-
13	CEC	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. Mechanical Specification

### 5.1 Case Dimension

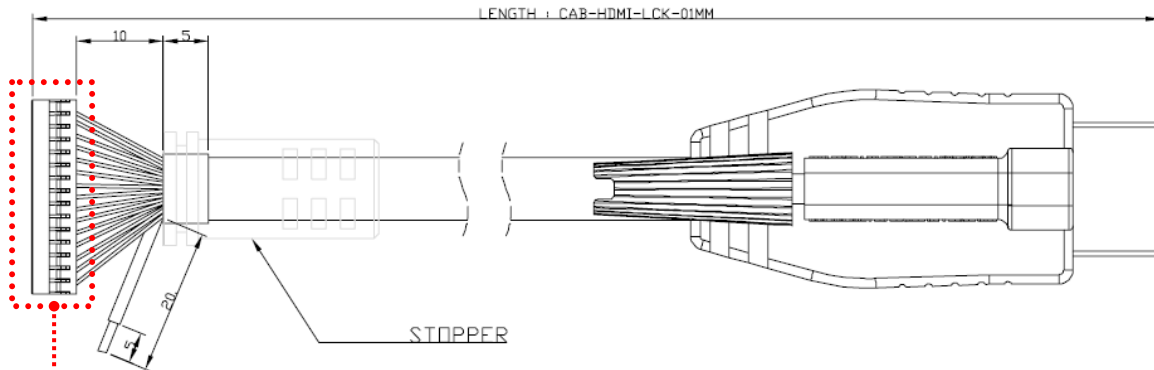


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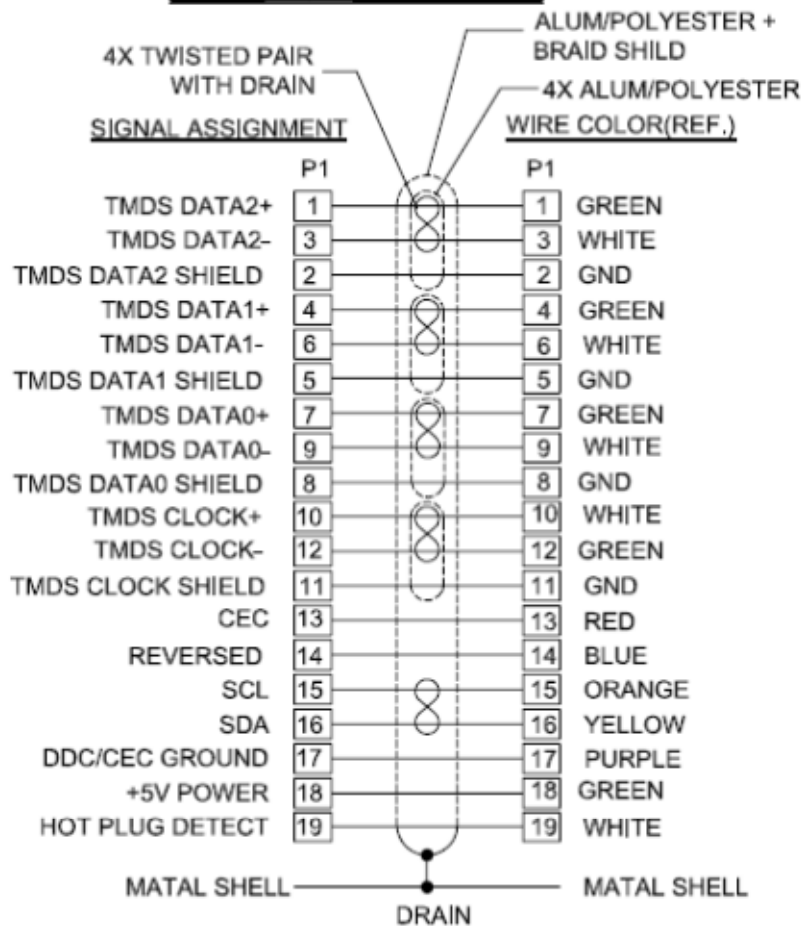
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### 5.2 Cable Information

#### 5.2.1 Copper Cable Information

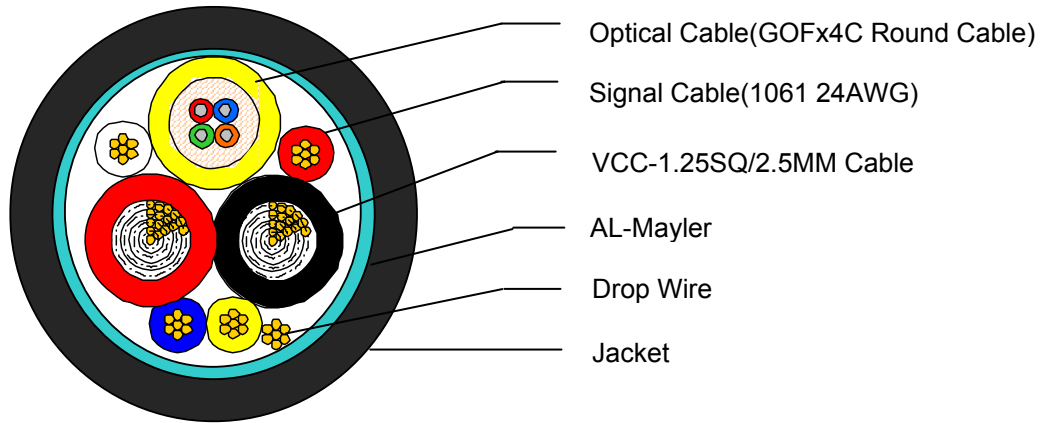


### WIRING DIAGRAM:



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.

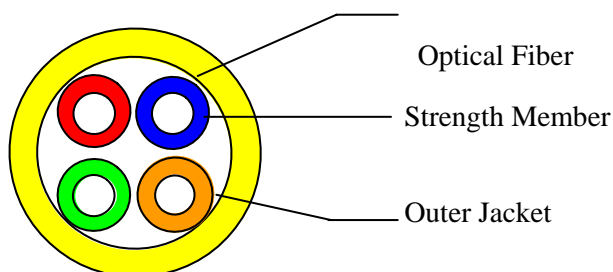


**Figure 1. Cable structure of HDMB2**

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

The Dimension of DPM2 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**

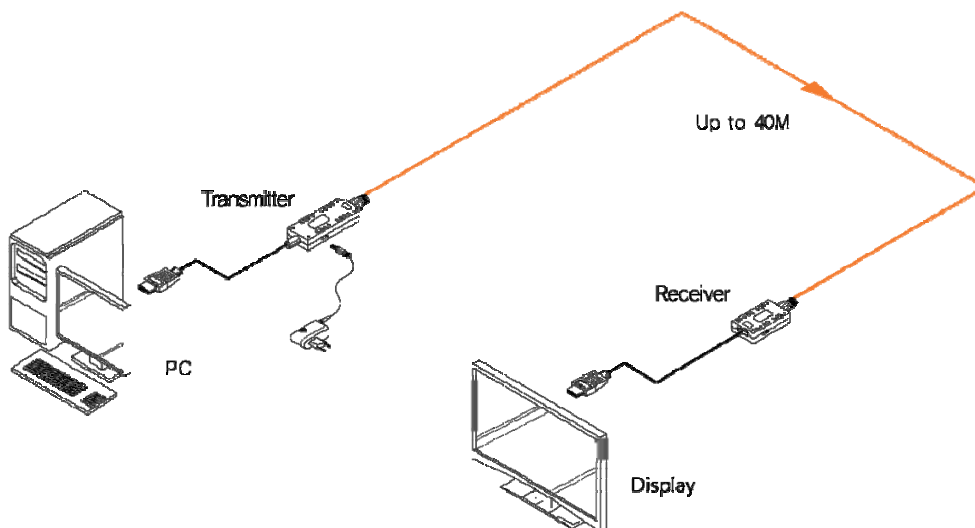
**Table 2. Fiber Cable Construction**

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		φ4.0±0.4mm
Approximate Net Weight		10kg/km
Cable Identification		OPTICAL 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)

5.3 Connection



## 6. Regulatory

### 6.1 EMC & Safety Agency approval

#### 6.1.1 CE-EMC compliance:

This Product is investigated to EN55032:2015, EN55024:2010, EN61000-3-2:2014 and EN61000-3-3:2013

#### 6.1.2 FCC compliance:

This Product is investigated to FCC 47CFR part 2 and part 15

## 7. Packing Information

ITEM	10M	15M	20M	30M	40M
UNIT(Unpacking, HDMB2 Only)	825.0g	1.15Kg	1.39Kg	2.0Kg	2.84Kg
Package(1EA, Inner Box Packing)	1.25Kg	1.50Kg	1.71Kg	2.35Kg	3.40Kg
Package(Multi, 5~10PCS Packing)	12.0Kg	13.0Kg	11.0Kg	12.0Kg	15.0Kg

HDMB2-A010	250.0mm×245.0mm×35.0mm
HDMB2-A015	260.0mm×260.0mm×40.0mm
HDMB2-A020	270.0mm×270.0mm×55.0mm
HDMB2-A030	280.0mm×280.0mm×65.0mm
HDMB2-A040	290.0mm×285.0mm×65.0mm

HDMB2-AXXX : "XXX" is length

**8. RoHS**

OPHIT is fully aware of the requirement under the **Restriction of Hazardous Substances in Electrical and Electronic Equipment Directive EU 2015/863(RoHS3)**, which adds four new restricted substances to the previous Directive 2011/65/EU(RoHS2).

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 all products.

Substance	CAS #	RoHS Limity by % (PPM)
Lead (PB)	7439-92-1	0.1% (1000 PPM)
Mercury (Hg)	7439-97-6	0.1% (1000 PPM)
Hexavalent Chromium (CrVI)	15840-29-9	0.1% (1000 PPM)
Polybrominated Biphenyls (PBB)	-	0.1% (1000 PPM)
Polybrominated Diphenyl Ethers (PBDE)	-	0.1% (1000 PPM)
Cadmium (Cd)	7440-43-9	0.01% (100 PPM)
Bis(2-Etylhexyl) phthalate(DEHP)	117-81-7	0.1% (1000 PPM)
Benzyl butyl phthalate(BBP)	85-68-7	0.1% (1000 PPM)
Dibutyl Phthalate(DBP)	84-74-2	0.1% (1000 PPM)
Disobutyl Phthalate(DIBP)	84-69-5	0.1% (1000 PPM)

Banned Substances by RoHS Directive 2011/65/EU+2015/863/EU, EN50581:2012

OPHIT will continue to monitor any new amendments/changes to Directive and subsequently review our all products with regards to compliance. OPHIT will also ensure that any new information is communicated to its customers, suppliers and stakeholders as required.

**Signature : Jong-Kook, Moon** *Jong-kook, Moon*  
**Title/Issue date : President/July.22.2019**



## 9. REACH

**The European REACH Regulation 1907/2006 on Registration, Evaluation, Authorization, and Restriction of Chemicals(REACH), Annex XV II** entered into Force in June 2009, and affects all companies producing, Importing, using, or placing Products on the European market. The aim of the REACH regulation is to ensure a high Level of protection of human health and the environment from chemical substances.

OPHIT Co., Ltd substances management system follow and complies with the current revision of the REACH Regulation on the substances as identified by ECHA(European Chemical Agency).

OPHIT Co., Ltd products are considered articles as defined in REACH Article 3(3). These products/articles under normal and reasonable conditions of use do not have intended release of substances. Therefore the requirement in REACH Article 7(1)(b) for registration of substances contained in these products/articles does not apply.

OPHIT Co., Ltd products/articles, do not contain **Substances of very High Concern** or if there **SVHC** in the product/article, the content is less than the 0.1%(wt/wt) as defined by REACH Article 57, Annex XIV, Directive 67/548/EEC. Therefore the requirement in REACH Article 7(2) to notify ECHA if a product/article contains more than 0.1% wt/wt of an SVHC and tonnage exceeding 1 tone per importer per year is not applicable.

OPHIT's European operations do not manufacture or import chemicals, therefore OPHIT Co., Ltd has no obligation to register substances.



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Jong-Kook, Moon  
President

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