

## EOLX-1696-23XXX Series

**XFP DWDM Single-Mode for 10GbE/10GFC/SDH/SONET  
Duplex XFP Transceiver  
RoHS6 Compliant**

### Features

- ◆ Available in all C-Band Wavelengths on the 50GHz DWDM ITU Grid

- ◆ Supports 9.95Gb/s to 11.1Gb/s Bit Rates

- ◆ Hot-pluggable XFP footprint

- ◆ Power budget 23dB

- ◆ Temperature-Stabilized DWDM Rated EML Transmitter

- ◆ Duplex LC connector

- ◆ Built-in Digital Diagnostic Functions

- ◆ Operating Case Temperature

Standard: 0°C to 70°C

Extended: -20°C to 75°C



### Applications

- ◆ 10GBASE-ZR/ZW

- ◆ 1200-SM-LL-L 10G Fiber Channel

- ◆ SONET OC-192 IR-2

- ◆ SDH STM S-64.2b

- ◆ SONET OC-192 IR-3

- ◆ SDH STM S-64.3b

- ◆ ITU-T G.709

### Ordering Information

Part No.	Data Rate	Laser	Fiber Type	Power Budget	Temp.	Optical Interface
EOLX-1696-23XXX <sup>N</sup> ote1	10G	EML EA	SMF	23dB	Standard	LC
EOLX-1696-23XXXE	10G	EML EA	SMF	23dB	Extended	LC

Note1: XXX refers to DWDM Wavelength channel as ITU-T specified, please refer the following table for detailed center wavelength information.

\*The product image only for reference purpose.

## DWDM Wavelength List:

*Channel (X)	Part NO.	Frequency (THz)	Center Wavelength (nm)
200	EOLX-1696-23200	192.00	1561.42
205	EOLX-1696-23205	192.05	1561.01
210	EOLX-1696-23210	192.10	1560.61
215	EOLX-1696-23215	192.15	1560.20
220	EOLX-1696-23220	192.20	1559.79
225	EOLX-1696-23225	192.25	1559.39
230	EOLX-1696-23230	192.30	1558.98
235	EOLX-1696-23235	192.35	1558.58
240	EOLX-1696-23240	192.40	1558.17
245	EOLX-1696-23245	192.45	1557.77
250	EOLX-1696-23250	192.50	1557.36
255	EOLX-1696-23255	192.55	1556.96
260	EOLX-1696-23260	192.60	1556.55
265	EOLX-1696-23265	192.65	1556.15
270	EOLX-1696-23270	192.70	1555.75
275	EOLX-1696-23275	192.75	1555.34
280	EOLX-1696-23280	192.80	1554.94
285	EOLX-1696-23285	192.85	1554.54
290	EOLX-1696-23290	192.90	1554.13
295	EOLX-1696-23295	192.95	1553.73
300	EOLX-1696-23300	193.00	1553.33
305	EOLX-1696-23305	193.05	1552.93
310	EOLX-1696-23310	193.10	1552.52
315	EOLX-1696-23310	193.15	1552.12
320	EOLX-1696-23320	193.20	1551.72
325	EOLX-1696-23325	193.25	1551.32
330	EOLX-1696-23330	193.30	1550.92
335	EOLX-1696-23335	193.35	1550.52
340	EOLX-1696-23340	193.40	1550.12
345	EOLX-1696-23345	193.45	1549.72
350	EOLX-1696-23350	193.50	1549.32
355	EOLX-1696-23355	193.55	1548.91
360	EOLX-1696-23360	193.60	1548.51
365	EOLX-1696-23365	193.65	1548.11
370	EOLX-1696-23370	193.70	1547.72
375	EOLX-1696-23375	193.75	1547.32
380	EOLX-1696-23380	193.80	1546.92
385	EOLX-1696-23385	193.85	1546.52
390	EOLX-1696-23390	193.90	1546.12

395	EOLX-1696-23395	193.95	1545.72
400	EOLX-1696-23400	194.00	1545.32
405	EOLX-1696-23405	194.05	1544.92
410	EOLX-1696-23410	194.10	1544.53
415	EOLX-1696-23415	194.15	1544.13
420	EOLX-1696-23420	194.20	1543.73
425	EOLX-1696-23425	194.25	1543.33
430	EOLX-1696-23430	194.30	1542.94
435	EOLX-1696-23435	194.35	1542.54
440	EOLX-1696-23440	194.40	1542.14
445	EOLX-1696-23445	194.45	1541.75
450	EOLX-1696-23450	194.50	1541.35
455	EOLX-1696-23455	194.55	1540.95
460	EOLX-1696-23460	194.60	1540.56
465	EOLX-1696-23465	194.65	1540.16
470	EOLX-1696-23470	194.70	1539.77
475	EOLX-1696-23475	194.75	1539.37
480	EOLX-1696-23480	194.80	1538.98
485	EOLX-1696-23485	194.85	1538.58
490	EOLX-1696-23490	194.90	1538.19
495	EOLX-1696-23495	194.95	1537.79
500	EOLX-1696-23500	195.00	1537.40
505	EOLX-1696-23505	195.05	1537.00
510	EOLX-1696-23510	195.10	1536.61
515	EOLX-1696-23515	195.15	1536.22
520	EOLX-1696-23520	195.20	1535.82
525	EOLX-1696-23525	195.25	1535.43
530	EOLX-1696-23530	195.30	1535.04
535	EOLX-1696-23535	195.35	1534.64
540	EOLX-1696-23540	195.40	1534.25
545	EOLX-1696-23545	195.45	1533.86
550	EOLX-1696-23550	195.50	1533.47
555	EOLX-1696-23555	195.55	1533.07
560	EOLX-1696-23560	195.60	1532.68
565	EOLX-1696-23565	195.65	1532.29
570	EOLX-1696-23570	195.70	1531.90
575	EOLX-1696-23575	195.75	1531.51
580	EOLX-1696-23580	195.80	1531.12
585	EOLX-1696-23585	195.85	1530.72
590	EOLX-1696-23590	195.90	1530.33
595	EOLX-1696-23595	195.95	1529.94

\*:Please contact with EOPTOLINK the channel you need for the further detail.

**Regulatory Compliance**

Product Certificate	Certificate Number	Applicable Standard
TUV	R50135086	EN 60950-1:2006+A11+A1+A12+A2
		EN 60825-1:2014
		EN 60825-2:2004+A1+A2
UL	E317337	UL 60950-1
		CSA C22.2 No. 60950-1-07
EMC CE	AE 50285865 0001	EN 55022:2010
		EN 55024:2010
FCC	WTF14F0514417E	47 CFR PART 15 OCT., 2013
FDA	/	CDRH 1040.10
ROHS	/	2011/65/EU

\*The above certificate number updated to June 2014, because some certificate will be updated every year, such as FDA and ROHS. For the latest certification information, please check with Eoptolink.

**Absolute Maximum Ratings**

Parameter	Symbol	Min	Typ	Max	Unit
Maximum Supply Voltage 1	Vcc3	-0.5		4.0	V
Maximum Supply Voltage 2	Vcc5	-0.5		6.0	V
Storage Temperature	T <sub>s</sub>	-40		85	°C
Case Operating Temperature	T <sub>c</sub>	-20		75	°C
Maximum Input Power	P <sub>m</sub>			-8	dBm

**Recommend operating condition**

Parameter	Symbol	Min	Typ	Max	Units
Case Operating Temperature	TC, EOLX-1696-14XX	0		70	°C
	TC, EOLX-1696-14XXE	-20		75	°C
Supply Voltage 1	Vcc3	3.13	3.3	3.45	V
Supply Voltage 2	Vcc5	4.75	5	5.25	V

**Electrical Characteristics**

(T<sub>c</sub> = -5 to 70°C, V<sub>CC5</sub> = 4.75 to 5.25 Volts)

Parameter	Symbol	Min	Typ	Max	Unit
Main Supply Voltage	Vcc5	4.75		5.25	V
Supply Voltage #2	Vcc3	3.13		3.45	V
Supply Current – Vcc5 supply	Icc5			400	mA
Supply Current – Vcc3 supply	Icc3			700	mA
Module Total Power	P			3.5	W
<b>Transmitter</b>					
Input Differential Impedance	R <sub>in</sub>		100		Ω

Differential Data Input Swing <sup>*3</sup>	Vin, pp	120		820	mV
Transmit Disable Voltage	VD	2.0		Vcc	V
Transmit Enable Voltage	VEN	GND		GND+ 0.8	V
Transmit Disable Assert Time				10	us
<b>Receiver</b>					
Differential Data Output Swing <sup>*3</sup>	Vout, pp	340	650	850	mV
Rise Time (20~80%)	tr			38	ps
Fall Time (20~80%)	tf			39	ps
LOS Fault <sup>*4</sup>	VLOS fault	Vcc – 0.5		VccHOST	V
LOS Normal <sup>*4</sup>	VLOS norm	GND		GND+0.5	V

Note3. After internal AC coupling.

Note4. Loss of signal is open collector to be pulled up with a 4.7k – 10kohm resistor to 3.15 – 3.6V. Logic 0 indicates normal operation; logic 1 indicates no signal detected.

## Optical Characteristics

(T<sub>C</sub>= -5 to 70°C, V<sub>CC5</sub> = 4.75 to 5.25 Volts)

Parameter	Symbol	Min	Typ	Max	Unit
<b>Transmitter</b>					
Center Wavelength Spacing			50		GHz
			0.4		nm
Output Opt. Pwr: 9/125 SMF	Pout	0		+4	dBm
Transmitter Center Wavelength End Of Life	λ	X-100	X	X+100	pm
Transmitter Center Wavelength Beginning Of Life	λ	X-25	X	X+25	pm
Optical Extinction Ratio	ER	8.2	9		dB
Transmitter and Dispersion Penalty	TDP			2	dB
Average Launch Power of OFF transmitter	POFF			-30	dBm
TX Jitter Generation (Peak-to-Peak)	Txj			0.1	UI
TX Jitter Generation (RMS)	TxjRMS			0.01	UI
<b>Receiver</b>					
Receiver Sensitivity @ 10.7Gb/s	RSENS			-23	dBm
Overload Power	PMAX	-10			dBm
Optical Center Wavelength	λ c	1520		1600	nm
Receiver Reflectance	Rrx			-27	dB
LOS De-Assert	LOSD			-26	dBm
LOS Assert	LOSA	-38			dBm

LOS Hysteresis		0.5			Db
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## Pin Descriptions

Pin	Symbol	Name/Description	Note
1	GND	Module Ground	5
2	VEE5	Optional –5.2 Power Supply – Not required	
3	Mod-Desel	Module De-select; When held low allows the module to respond to 2-wire serial interface commands	
4	Interrupt	Interrupt (bar); Indicates presence of an important condition which can be read over the serial 2-wire interface	6
5	TX_DIS	Transmitter Disable; Transmitter laser source turned off	
6	VCC5	+5 Power Supply	
7	GND	Module Ground	5
8	VCC3	+3.3V Power Supply	
9	VCC3	+3.3V Power Supply	
10	SCL	Serial 2-wire interface clock line	6
11	SDA	Serial 2-wire interface data line	6
12	Mod_Abs	Module Absent; Indicates module is not present. Grounded in the module.	6
13	Mod_NR	Module Not Ready;	6
14	RX_LOS	Receiver Loss of Signal indicator	6
15	GND	Module Ground	5
16	GND	Module Ground	5
17	RD-	Receiver inverted data output	
18	RD+	Receiver non-inverted data output	
19	GND	Module Ground	5
20	VCC2	+1.8V Power Supply – Not required	
21	P_Down/RS T	Power Down; When high, places the module in the low power stand-by mode and on the falling edge of P_Down initiates a module reset	
		Reset; The falling edge initiates a complete reset of the module including the 2-wire serial interface, equivalent to a power cycle.	
22	VCC2	+1.8V Power Supply – Not required	
23	GND	Module Ground	5
24	RefCLK+	Reference Clock non-inverted input, AC coupled on the host board – Not required	7
25	RefCLK-	Reference Clock inverted input, AC coupled on the host board – Not required	7
26	GND	Module Ground	5
27	GND	Module Ground	5
28	TD-	Transmitter inverted data input	

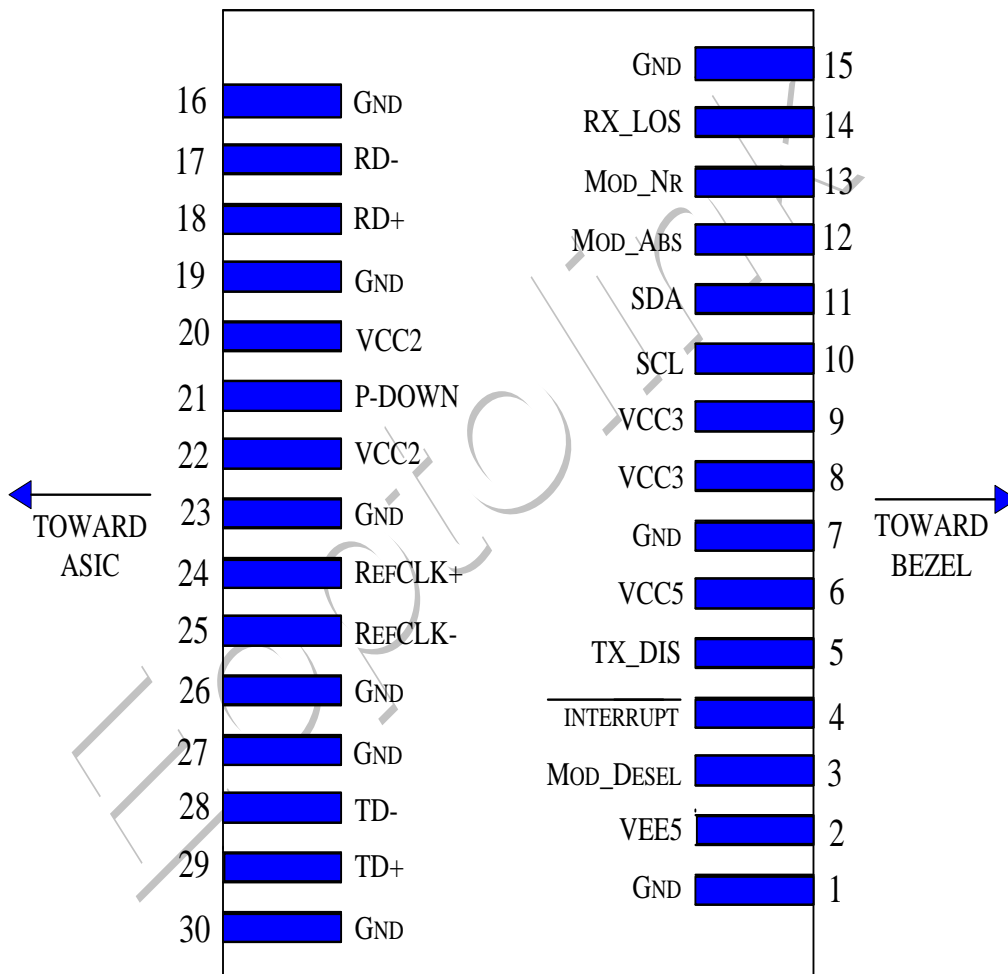
29	TD+	Transmitter non-inverted data input	
30	GND	Module Ground	5

Note5. Module circuit ground is isolated from module chassis ground within the module.

Note6. Open collector; should be pulled up with 4.7k – 10k ohm on host board to a voltage between 3.15V and 3.6V.

Note7. A Reference Clock input is not required.

## Pin arrangement



Pin Numbers and Name

## General Specifications

Parameter	Symbol	Min	Typ	Max	Units	Note
Bit Rate	BR	9.95		11.1	Gb/s	8
Bit Error Ratio	BER			10 <sup>-12</sup>		9
Max. Supported Link Budget	LMAX	23	24		dB	8

Note8. SONET OC-192 IR-2, OC-192 IR-3, ITU-T G.709, 10GBASE-ZR/ZW + FEC, 10G Fiber Channel

Note9. Tested with a  $2^{31} - 1$  PRBS

## Digital Diagnostic Functions

Eoptolink's EOLX-1696-23XXX Small Form Factor 10Gbps (XFP) transceivers are compliant with the current XFP Multi-Source Agreement (MSA) Specification Rev 4.5.

As defined by the XFP MSA, Eoptolink XFP transceivers provide digital diagnostic functions via a 2-wire serial interface, which allows real-time access to the following operating parameters:

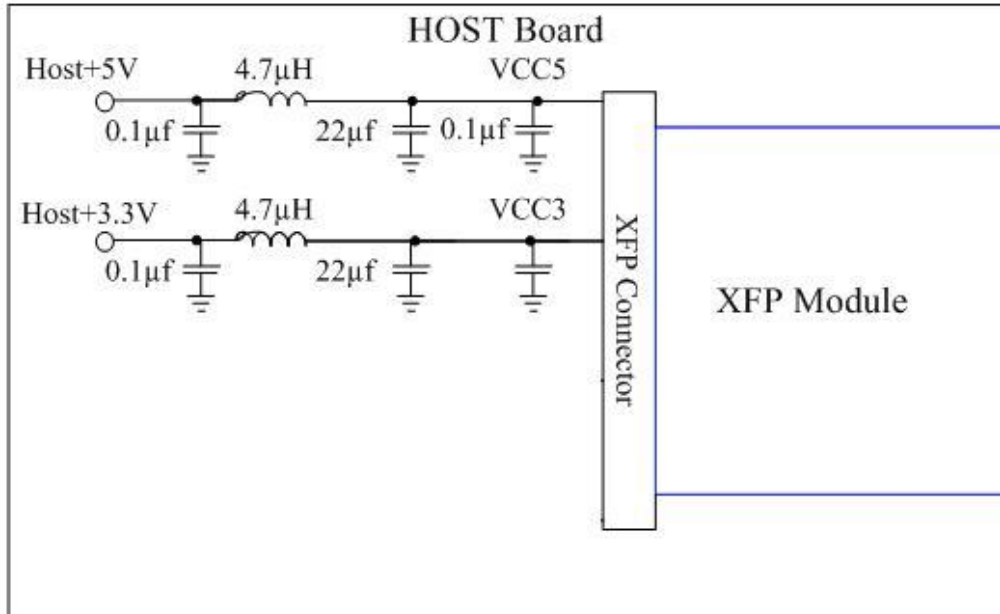
- ◆ Transceiver temperature
- ◆ Laser bias current
- ◆ Transmitted optical power
- ◆ Received optical power
- ◆ Transceiver supply voltage

It also provides a sophisticated system of alarm and warning flags, which may be used to alert end-users when particular operating parameters are outside of a factory-set normal range.

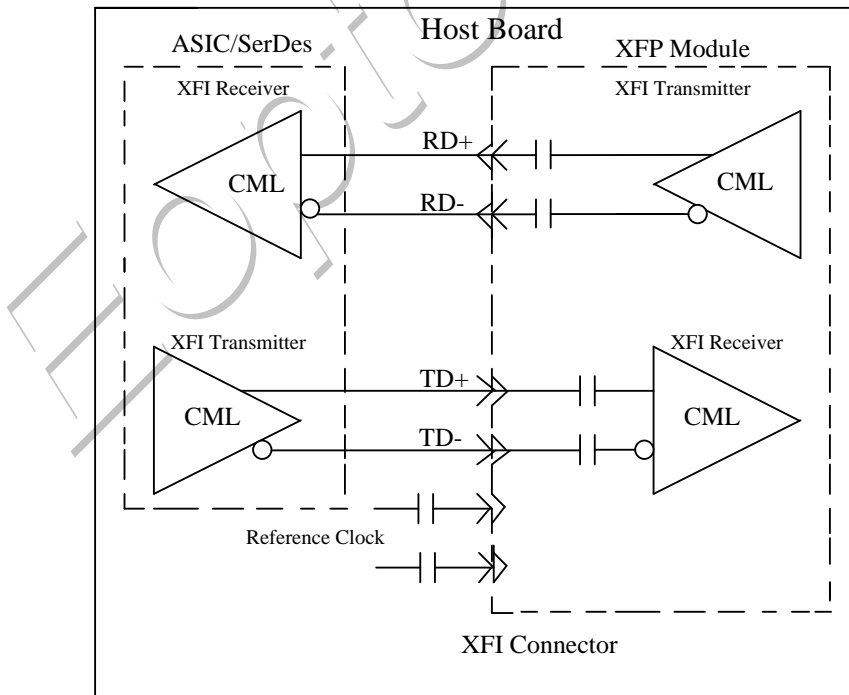
The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller inside the transceiver, which is accessed through the 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL pin) is generated by the host. The positive edge clocks data into the XFP transceiver into those segments of its memory map that are not write-protected. The negative edge clocks data from the XFP transceiver. The serial data signal (SDA pin) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially. The 2-wire serial interface provides sequential or random access to the 8 bit parameters, addressed from 000h to the maximum address of the memory.



**Recommended Host Board Power Supply Circuit**

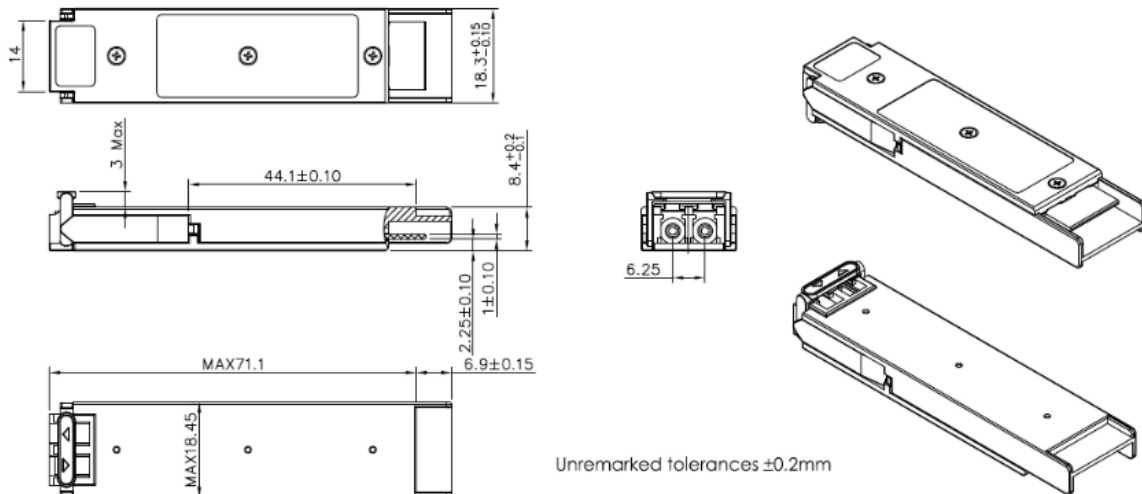


**Recommended High-Speed Interface Circuit**



**Mechanical Specifications**

Eoptolink's XFP transceivers are compliant with the dimensions defined by the XFP Multi-Sourcing Agreement (MSA).



\*This 2D drawing only for reference, please check with Eoptolink before ordering.

## Eye Safety

This single-mode transceiver is a Class 1 laser product. It complies with IEC-60825 and FDA 21 CFR 1040.10 and 1040.11. The transceiver must be operated within the specified temperature and voltage limits. The optical ports of the module shall be terminated with an optical connector or with a dust plug.

## Obtaining Document

You can visit our website:

<http://www.eoptolink.com>

Or contact Eoptolink Technology Inc., Ltd. Listed at the end of the documentation to get the latest documents.

## Revision History

Revision	Initiated	Reviewed	Approved	Revision History	Release Date
V3.a	Kelly			Update PN&Pout, power budget.	May 27, 2011
V4.0	Alex/Townie	Kelly		Update photo	Aug 10, 2011
V4.a	Kelly			Update supply circuit&sensitivity.	Sep 19, 2011
V4.b	Angela	Abby		Update LOS Deassert/Assert.	Sep 18, 2012
V4.c	Neal	Kelly/ Angela/Fing/ Elaine/		Update Temp. output power, 2D Mechanical	Aug 25, 2017

		JP/Eason/Torres/Chao.Wang		Specifications,the address and the contact information	
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**Notice:**

Eoptolink reserves the right to make changes to or discontinue any optical link product or service identified in this publication, without notice, in order to improve design and/or performance. Applications that are described herein for any of the optical link products are for illustrative purposes only. Eoptolink makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

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