

EOLP-1696-TDW-23XXXN MSA Series

SFP+ Single-Mode Tunable Transceiver
RoHS6 Compliant

Features

- ◆ Support data rate 0.614 to 11.3Gbps
- ◆ 1550 nm ITU-T C-band 50 GHz spacing Tunable DWDM SFP+ Transceiver Temperature-Stabilized DWDM EML Transmitter
- ◆ Negative chirp transmitter with ILMZ (Integrated Laser Mach Zehnder) TOSA
- ◆ APD receiver with limiting amplifier
- ◆ Low power consumption: <1.8 W at 70°C
- ◆ Positive power supply lines: 3.3 V
- ◆ Hot-Pluggable SFP+ Footprint
- ◆ Compliant with SFF-8431 MSA
- ◆ Compliant with SFF-8432 MSA
- ◆ Operating Case Temperature
- ◆ Standard: 0°C to 70°C



Applications

- ◆ 10GBASE-ZR/ZW
- ◆ 10G FC
- ◆ CPRI rates 9.830 Gb/s, 7.373Gb/s, 6.144 Gb/s, 4.915 Gb/s, 2.458 Gb/s, 1.229 Gb/s, 0.614Gb/s
- ◆ Other optical links

Ordering Information

Part No.	Data Rate	Laser	Power budget	CDR	Temp.
EOLP-1696-TDW-23XXXN ^{*(note1)}	0.614 to 11.3Gbps	ILMZ	23dB	No	Standard

Note1: XXX refers to DWDM Wavelength channel as ITU-T specified.

DWDM Wavelength List:

*Channel (X)	Part NO.	Frequency (THz)	Center Wavelength (nm)
1	EOLP-1696-TDW-23115N	191.15	1568.36
2	EOLP-1696-TDW-23120N	191.20	1567.95
3	EOLP-1696-TDW-23125N	191.25	1567.54
4	EOLP-1696-TDW-23130N	191.30	1567.13
5	EOLP-1696-TDW-23135N	191.35	1566.72
6	EOLP-1696-TDW-23140N	191.40	1566.31
7	EOLP-1696-TDW-23145N	191.45	1565.90
8	EOLP-1696-TDW-23150N	191.50	1565.50
9	EOLP-1696-TDW-23155N	191.55	1565.09
10	EOLP-1696-TDW-23160N	191.60	1564.68
11	EOLP-1696-TDW-23165N	191.65	1564.27
12	EOLP-1696-TDW-23170N	191.70	1563.86
13	EOLP-1696-TDW-23175N	191.75	1563.45
14	EOLP-1696-TDW-23180N	191.80	1563.05
15	EOLP-1696-TDW-23185N	191.85	1562.64
16	EOLP-1696-TDW-23190N	191.90	1562.23
17	EOLP-1696-TDW-23195N	191.95	1561.83
18	EOLP-1696-TDW-23200N	192.00	1561.42
19	EOLP-1696-TDW-23205N	192.05	1561.01
20	EOLP-1696-TDW-23210N	192.10	1560.61
21	EOLP-1696-TDW-23215N	192.15	1560.20
22	EOLP-1696-TDW-23220N	192.20	1559.79
23	EOLP-1696-TDW-23225N	192.25	1559.39
24	EOLP-1696-TDW-23230N	192.30	1558.98
25	EOLP-1696-TDW-23235N	192.35	1558.58
26	EOLP-1696-TDW-23240N	192.40	1558.17
27	EOLP-1696-TDW-23245N	192.45	1557.77
28	EOLP-1696-TDW-23250N	192.50	1557.36
29	EOLP-1696-TDW-23255N	192.55	1556.96
30	EOLP-1696-TDW-23260N	192.60	1556.55
31	EOLP-1696-TDW-23265N	192.65	1556.15
32	EOLP-1696-TDW-23270N	192.70	1555.75
33	EOLP-1696-TDW-23275N	192.75	1555.34
34	EOLP-1696-TDW-23280N	192.80	1554.94
35	EOLP-1696-TDW-23285N	192.85	1554.54
36	EOLP-1696-TDW-23290N	192.90	1554.13
37	EOLP-1696-TDW-23295N	192.95	1553.73
38	EOLP-1696-TDW-23300N	193.00	1553.33

39	EOLP-1696-TDW-23305N	193.05	1552.93
40	EOLP-1696-TDW-23310N	193.10	1552.52
41	EOLP-1696-TDW-23315N	193.15	1552.12
42	EOLP-1696-TDW-23320N	193.20	1551.72
43	EOLP-1696-TDW-23325N	193.25	1551.32
44	EOLP-1696-TDW-23330N	193.30	1550.92
45	EOLP-1696-TDW-23335N	193.35	1550.52
46	EOLP-1696-TDW-23340N	193.40	1550.12
47	EOLP-1696-TDW-23345N	193.45	1549.72
48	EOLP-1696-TDW-23350N	193.50	1549.32
49	EOLP-1696-TDW-23355N	193.55	1548.91
50	EOLP-1696-TDW-23360N	193.60	1548.51
51	EOLP-1696-TDW-23365N	193.65	1548.11
52	EOLP-1696-TDW-23370N	193.70	1547.72
53	EOLP-1696-TDW-23375N	193.75	1547.32
54	EOLP-1696-TDW-23380N	193.80	1546.92
55	EOLP-1696-TDW-23385N	193.85	1546.52
56	EOLP-1696-TDW-23390N	193.90	1546.12
57	EOLP-1696-TDW-23395N	193.95	1545.72
58	EOLP-1696-TDW-23400N	194.00	1545.32
59	EOLP-1696-TDW-23405N	194.05	1544.92
60	EOLP-1696-TDW-23410N	194.10	1544.53
61	EOLP-1696-TDW-23415N	194.15	1544.13
62	EOLP-1696-TDW-23420N	194.20	1543.73
63	EOLP-1696-TDW-23425N	194.25	1543.33
64	EOLP-1696-TDW-23430N	194.30	1542.94
65	EOLP-1696-TDW-23435N	194.35	1542.54
66	EOLP-1696-TDW-23440N	194.40	1542.14
67	EOLP-1696-TDW-23445N	194.45	1541.75
68	EOLP-1696-TDW-23450N	194.50	1541.35
69	EOLP-1696-TDW-23455N	194.55	1540.95
70	EOLP-1696-TDW-23460N	194.60	1540.56
71	EOLP-1696-TDW-23465N	194.65	1540.16
72	EOLP-1696-TDW-23470N	194.70	1539.77
73	EOLP-1696-TDW-23475N	194.75	1539.37
74	EOLP-1696-TDW-23480N	194.80	1538.98
75	EOLP-1696-TDW-23485N	194.85	1538.58
76	EOLP-1696-TDW-23490N	194.90	1538.19
77	EOLP-1696-TDW-23495N	194.95	1537.79
78	EOLP-1696-TDW-23500N	195.00	1537.40
79	EOLP-1696-TDW-23505N	195.05	1537.00
80	EOLP-1696-TDW-23510N	195.10	1536.61

81	EOLP-1696-TDW-23515N	195.15	1536.22
82	EOLP-1696-TDW-23520N	195.20	1535.82
83	EOLP-1696-TDW-23525N	195.25	1535.43
84	EOLP-1696-TDW-23530N	195.30	1535.04
85	EOLP-1696-TDW-23535N	195.35	1534.64
86	EOLP-1696-TDW-23540N	195.40	1534.25
87	EOLP-1696-TDW-23545N	195.45	1533.86
88	EOLP-1696-TDW-23550N	195.50	1533.47
89	EOLP-1696-TDW-23555N	195.55	1533.07
90	EOLP-1696-TDW-23560N	195.60	1532.68
91	EOLP-1696-TDW-23565N	195.65	1532.29
92	EOLP-1696-TDW-23570N	195.70	1531.90
93	EOLP-1696-TDW-23575N	195.75	1531.51
94	EOLP-1696-TDW-23580N	195.80	1531.12
95	EOLP-1696-TDW-23585N	195.85	1530.72
96	EOLP-1696-TDW-23590N	195.90	1530.33
97	EOLP-1696-TDW-23595N	195.95	1529.94
98	EOLP-1696-TDW-23600N	196.00	1529.55
99	EOLP-1696-TDW-23605N	196.05	1529.16

*: The wavelength is default while manufacture, please contact EOPOTLINK while ordering.

Regulatory Compliance ^{*Note2}

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

*Note2; 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.

Product Description

The EOLP-1696--TDW-23XXXN Tunable SFP+ module is a high performance tunable pluggable transceiver for use in the C-band window covering 1529 nm to 1568 nm. The module supports data rates from 0.614 Gb/s to 11.3 Gb/s and is provided in an SFP+, MSA compliant package. The optical transmitter utilizes the Tunable ILMZ chip to provide a high performance, low cost 10 Gb/s transceiver. Channel tuning is supported on the ITU-T 50 GHz grid across full C-band with ± 2.5 GHz stability. Wavelength and frequency tuning modes are supported in accordance with

SFF-8690.

The receive path comprises an APD receiver with limiting amplifier.

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	Ts	-40	+85	°C
Supply Voltage	Vcc	-0.5	3.6	V
ESD SFI pins	ESD1		1	kV
ESD except for SFI pins	ESD2		2	kV
Operating Relative Humidity		-	95	%

*Exceeding any one of these values may destroy the device immediately.

Recommended Operating Conditions

Parameter	Symbol		Min.	Typical	Max.	Unit
Operating Case Temperature	T _c	Standard	0		+70	°C
Power Supply Voltage	Vcc		3.13	3.3	3.46	V
Power Supply Current	Icc				550	mA
Date Rate	EOLP-1696-TDW -23XXXN		0.614		11.3	Gbps

Performance Specifications – Electrical

Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
Transmitter						
CML Inputs(Differential)	Vin	250		1000	mVpp	AC coupled input*(note3)
Input Impedance (Differential)	Zin	85	100	115	ohm	Rin > 100 kohm @ DC
TX_Dis	Disable	2		Vcc+0.3	V	
	Enable	0		0.8		
TX_FAULT	Fault	2.4		Vcc+0.3	V	
	Normal	0		0.4		
Receiver						
CML Outputs (Differential)	Vout	350		850	mVpp	AC coupled output*(note3)
Output Impedance (Differential)	Zout	85	100	115	ohm	
RX_LOS	LOS	2.4		Vcc+0.3	V	
	Normal	0		0.4	V	
MOD_DEF (0:2)	VoH	2.5			V	With Serial ID
	VoL	0		0.5	V	

Performance Specifications – Optical

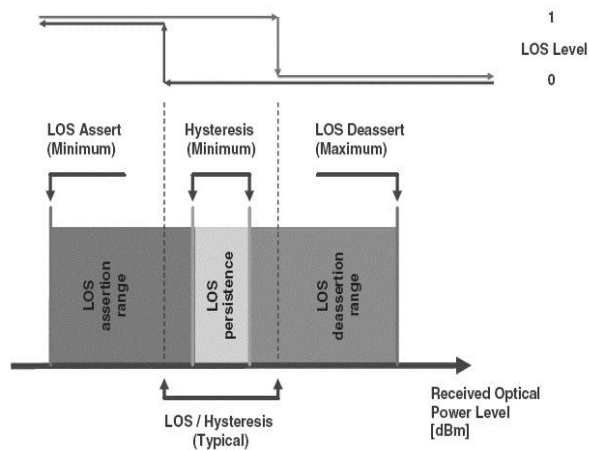
Parameter	Symbol	Min.	Typical	Max.	Unit
Data Rate		0.614		11.3	Gbps
Transmitter					
Center Wavelength Spacing			50		GHz
			0.3	0.5	nm
Side Mode Suppression Ratio	SMSR	30			dB
Average Output Power(BOL) ^{*(note4)}	Pout	-1		+3	dBm
Average Launch Power (Tx: OFF)	Poff			-35	dBm
Extinction Ratio EOLP-1696-TDW-23XXN	ER	9			dB
Eye diagram compliance	GR-253, ITU-T G.691				
Pout@TX Disable Asserted	Pout			-45	dBm
Mask margin		10			%
Tuning speed (From one channel to another channel)				10	Sec
Receiver					
Input operating wavelength		1525		1575	nm
Receiver Sensitivity (B2B) ^{*(note5)}	Pmin			-24	dBm
Receiver Overload	Pmax	-7			dBm
Receiver Reflectance	RL			-27	dB
LOS De-Assert ^{*(note6)}	LOSD			-25	dBm
LOS Assert ^{*(note6)}	LOSA	-42		-26	dBm
LOS Hysteresis		0.5		4.0	dB

Note3: CML logic, internally AC coupled.

Note4: Output is coupled into a 9/125µm single-mode fiber.

Note5: Minimum average optical power measured at the 10.3125Gbps, ER>9dB, BER less than 1E-12, OSNR > 30dB, PRBS 2³¹-1.

Note6: Rx LOS Assert and De-Assert.



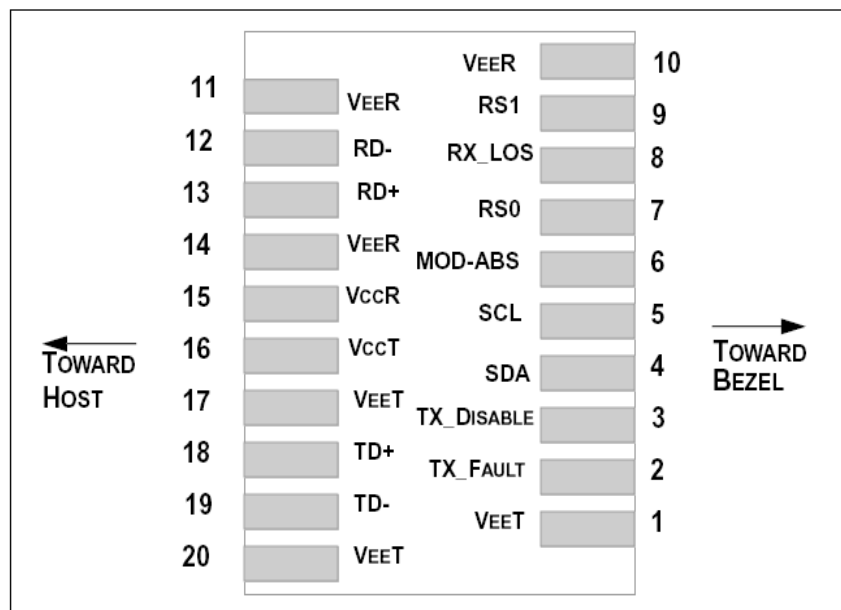
Time Specification

Parameter	Symbol	Min.	Typical	Max.	Unit
Tx_Disable assert time	t_off			100	us
Tx_Disable negate time	t_on			50	ms
Tx_Fault assert	t_fault_a			50	ms
Tx_Fault reset	t_fault_r	10			us
Loss Assert Delay	t_loss_a			100	us
Loss De-Assert Delay	t_loss_d			100	us
TEC Initiation time (Hot plug to TEC Cool)	t_tec_c			90	S
Time to I2C Ready	t_i2c_ini			300	ms

System Performance

Parameter	Min.	Max.	OSNR Resolution BW 0.1nm	BER	Remark
Noise Loaded	-400ps/nm	1400 ps/nm	19dB	1E-04	10.709Gb/s, -10 to -20dBm, 0.25nm filter BW, Rx DTV optimized
Unamplified links	0 ps/nm	1400 ps/nm	>35dB	1E-12	10.709Gb/s, -20dBm, 0.25nm filter BW, Rx DTV optimized

SFP+ Transceiver Electrical Pad Layout



Pin Function Definition

Pin Num.	Name	FUNCTION	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	Note 5
2	TX Fault	Transmitter Fault Indication	3	Note 1
3	TX Disable	Transmitter Disable	3	Note 2, Module disables on high or open
4	SDA	Module Definition 2	3	2-wire Serial Interface Data Line.
5	SCL	Module Definition 1	3	2-wire Serial Interface Clock.
6	MOD-ABS	Module Definition 0	3	Note 3
7	RS0	RX Rate Select (LVTTTL).	3	Rate Select 0, optionally controls SFP+ module receiver. This pin is pulled low to VeeT with a >30K resistor
8	LOS	Loss of Signal	3	Note 4
9	RS1	TX Rate Select (LVTTTL).	1	Rate Select 1, optionally controls SFP+ module transmitter. This pin is pulled low to VeeT with a >30K resistor
10	VeeR	Receiver Ground	1	Note 5
11	VeeR	Receiver Ground	1	Note 5
12	RD-	Inv. Received Data Out	3	Note 6
13	RD+	Received Data Out	3	Note 7
14	VeeR	Receiver Ground	1	Note 5
15	VccR	Receiver Power	2	3.3 ± 5%, Note 7
16	VccT	Transmitter Power	2	3.3 ± 5%, Note 7
17	VeeT	Transmitter Ground	1	Note 5
18	TD+	Transmit Data In	3	Note 8
19	TD-	Inv. Transmit Data In	3	Note 8
20	VeeT	Transmitter Ground	1	Note 5

Notes:

1) TX Fault is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor on the host board. Pull up voltage between 2.0V and VccT, R+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

2) TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7 – 10 KΩ resistor. Its states are:

Low (0 – 0.8V): Transmitter on

(>0.8, < 2.0V): Undefined

High (2.0 – 3.465V): Transmitter Disabled

Open: Transmitter Disabled

3) Module absent, connected to VEET or VEER in the module.

4) LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10K Ω resistor. Pull up voltage between 2.0V and VccT, R+0.3V. When high, this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

5) The module signal ground contacts, VeeR and VeeT, should be isolated from the module case

6) RD-/+ : These are the differential receiver outputs. They are AC coupled 100 Ω differential lines which should be terminated with 100 Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board.

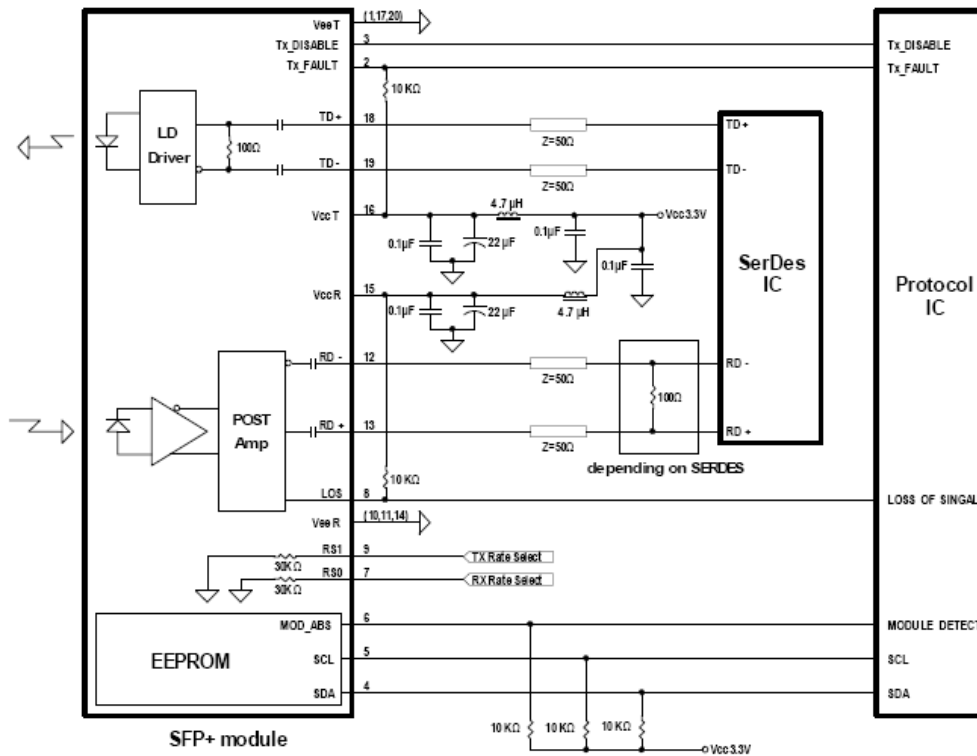
7) VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V \pm 5% at the SFP+ connector pin. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP+ input pin with 3.3V supply voltage. VccR and VccT may be internally connected within the SFP+ transceiver module.

8) TD-/+ : These are the differential transmitter inputs. They are AC-coupled, differential lines with 100 Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board.

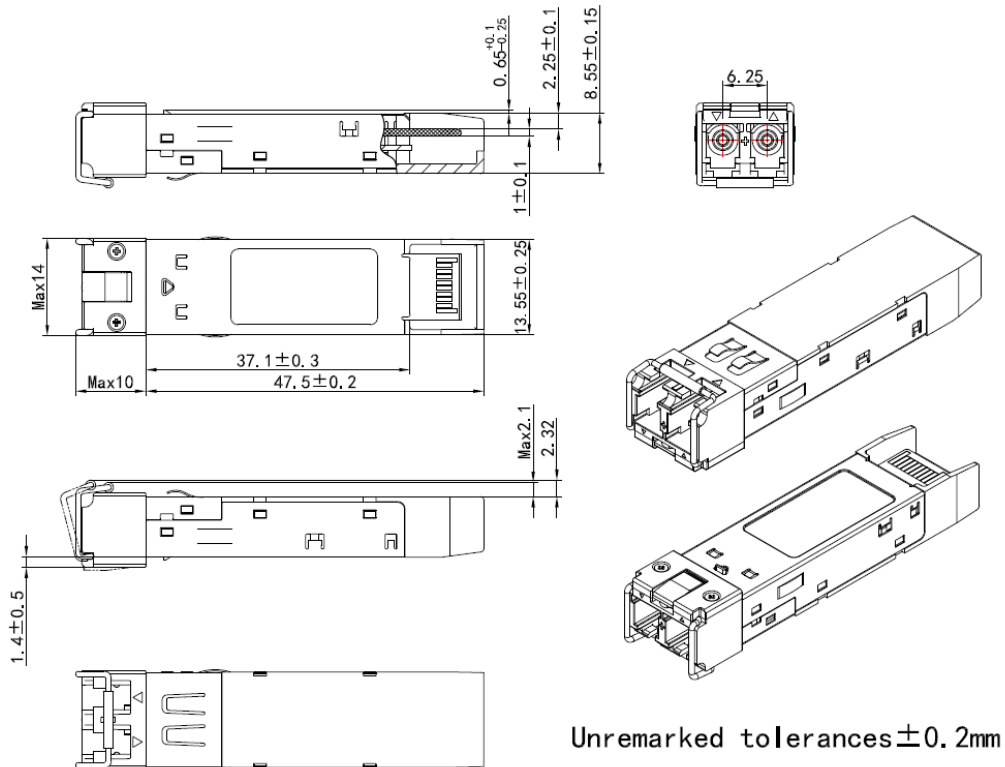
EEPROM

Please reference SFF-8690 – Tunable SFP+ Memory Map for ITU Frequencies

Recommend Circuit Schematic

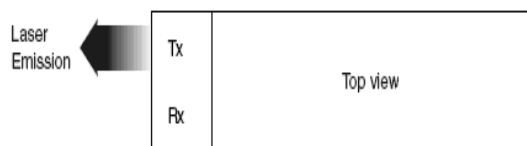


Mechanical Specifications



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

Laser Emission



Obtaining Document

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<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	DCN	Release Date
V1.a	Oliver	Kelly/Sky	Phlio	Released.	March 6, 2017
V1.b	Oliver	Kelly/Sky	Phlio	Update Product Image.	March 17, 2017
V1.c	Oliver	Kelly/Sky/Bruce	Phlio	Update the power consumption and Wavelength channel	May 15, 2017
V1.d	Elaine	Oliver/Kelly		Correct a slip of the pen	Jun 14, 2017
V1.e	Oliver	Kelly/Downey/Bruce	Phlio	Update the date rate	Jul 01, 2017

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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