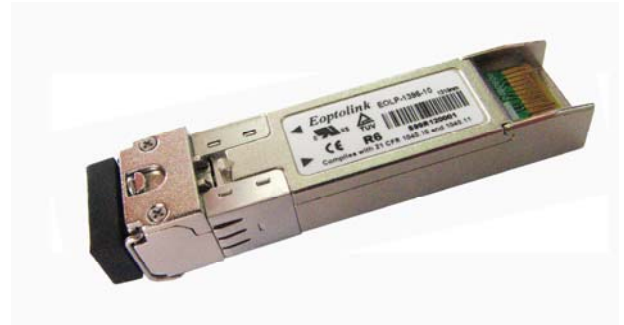


EOLP-1696-23XXXN MSA Series

SFP+ Single-Mode for DWDM Application
Duplex SFP+ Transceiver
Digital Diagnostic Function
RoHS6 Compliant

Features

- ◆ Support data rate up to 11.3Gbps
- ◆ Available in all C-Band Wavelengths on the 50GHz DWDM ITU Grid
- ◆ Temperature-Stabilized DWDM EML Transmitter
- ◆ Duplex LC Connector
- ◆ Power Dissipation < 1.5W
- ◆ Dispersion tolerance from -500ps/nm to 1600ps/nm
- ◆ Hot-Pluggable SFP+ Footprint
- ◆ Compliant with SFF-8431 MSA
- ◆ Compliant with SFF-8432 MSA
- ◆ Operating Case Temperature
- ◆ Standard: 0°C to 70°C
- ◆ Industrial: -40°C~+85°C



Applications

- ◆ 10GBASE-ZR/ZW
- ◆ 10G FC
- ◆ OBSAI rates 6.144 Gb/s, 3.072 Gb/s, 1.536 Gb/s, 0.768Gb/s
- ◆ 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
- ◆

Ordering Information

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

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

XXX- Channel refers to the following table:

*Channel (X)	Part NO.	Frequency (THz)	Center Wavelength (nm)
200	EOLP-1696-23200N	192.00	1561.42
205	EOLP-1696-23205N	192.05	1561.01
210	EOLP-1696-23210N	192.10	1560.61
215	EOLP-1696-23215N	192.15	1560.20
220	EOLP-1696-23220N	192.20	1559.79
225	EOLP-1696-23225N	192.25	1559.39
230	EOLP-1696-23230N	192.30	1558.98
235	EOLP-1696-23235N	192.35	1558.58
240	EOLP-1696-23240N	192.40	1558.17
245	EOLP-1696-23245N	192.45	1557.77
250	EOLP-1696-23250N	192.50	1557.36
255	EOLP-1696-23255N	192.55	1556.96
260	EOLP-1696-23260N	192.60	1556.55
265	EOLP-1696-23265N	192.65	1556.15
270	EOLP-1696-23270N	192.70	1555.75
275	EOLP-1696-23275N	192.75	1555.34
280	EOLP-1696-23280N	192.80	1554.94
285	EOLP-1696-23285N	192.85	1554.54
290	EOLP-1696-23290N	192.90	1554.13
295	EOLP-1696-23295N	192.95	1553.73
300	EOLP-1696-23300N	193.00	1553.33
305	EOLP-1696-23305N	193.05	1552.93
310	EOLP-1696-23310N	193.10	1552.52
315	EOLP-1696-23315N	193.15	1552.12
320	EOLP-1696-23320N	193.20	1551.72
325	EOLP-1696-23325N	193.25	1551.32
330	EOLP-1696-23330N	193.30	1550.92
335	EOLP-1696-23335N	193.35	1550.52
340	EOLP-1696-23340N	193.40	1550.12
345	EOLP-1696-23345N	193.45	1549.72
350	EOLP-1696-23350N	193.50	1549.32
355	EOLP-1696-23355N	193.55	1548.91
360	EOLP-1696-23360N	193.60	1548.51
365	EOLP-1696-23365N	193.65	1548.11
370	EOLP-1696-23370N	193.70	1547.72
375	EOLP-1696-23375N	193.75	1547.32
380	EOLP-1696-23380N	193.80	1546.92
385	EOLP-1696-23385N	193.85	1546.52
390	EOLP-1696-23390N	193.90	1546.12

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

Regulatory Compliance

Product Certificate	Certificate Number	Applicable Standard
TUV	R50135086	EN 60950-1:2006+A11+A1+A12
		EN 60825-1:2007
		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
CB	JPTUV-049251	IEC 60825-1
		IEC 60950-1
FCC	WTF14F0514437E	47 CFR PART 15 OCT., 2013
FDA	1331340-000	CDRH 1040.10
ROHS	RHS01G006464	2011/65/EU

Note2: The above certificate number updated to June 2014, because some certificate will be updated every year, such as FCC, FDA and ROHS. For the latest certification information, please check with Eoptolink.

Product Description

The EOLP-1696-23XXXN series single mode transceiver is small form factor pluggable module for duplex optical data communications. This module is designed for single mode fiber and operates at a nominal DWDM wavelength from 1528nm to 1566nm as specified by the ITU-T. It is designed to deploy in the DWDM networking equipment in metropolitan access and core networks.

It is with the SFP+ 20-pin connector to allow hot plug capability. The transmitter section uses a DWDM EML laser and is a class 1 laser compliant according to International Safety Standard IEC-60825. The receiver section uses an APD detector and a limiting post-amplifier IC.

The EOLP-1696-23XXXN series are designed to be compliant with SFP+ Multi-Source Agreement (MSA) Specification SFF-8431 and 8432.

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T _s	-40	+85	°C
Supply Voltage	V _{cc}	-0.5	3.6	V
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
		Industrial	-40	85	°C

Power Supply Voltage	Vcc	3.15	3.3	3.45	V
Power Supply Current	Icc		300	430	mA
Date Rate	EOLP-1696-23XXXN	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		Vcc+0.3	V	
	Normal	0		0.5		
Receiver						
CML Outputs (Differential)	Vout	350		700	mVpp	AC coupled output*(note3)
Output Impedance (Differential)	Zout	85	100	115	ohm	
RX_LOS	LOS	2		Vcc+0.3	V	
	Normal	0		0.8	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
			0.4		nm
Side Mode Suppression Ratio	SMSR	30			dB
Average Output Power*(note4)	Pout	0		5	dBm
Average Launch Power (Tx: OFF)	Poff			-30	dBm
Extinction Ratio EOLP-1696-23XXN	ER	3.5			dB
Pout@TX Disable Asserted	Pout			-45	dBm
Transmitter Dispersion Penalty@1600ps/nm	TDP			3.5	dB
Relative Intensity Noise	RIN			-128	dB/Hz
TX Jitter	TXj	Per 802.3ae requirements			
Receiver					
Receiver Sensitivity*(note5)	Pmin			-23	dBm
Receiver Overload	Pmax	-8			dBm

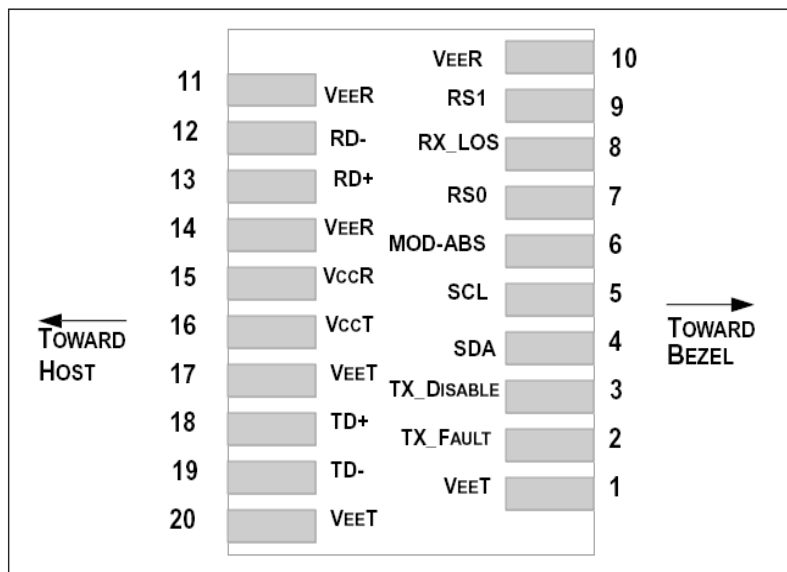
LOS De-Assert	LOSD			-24	dBm
LOS Assert	LOSA	-35			dBm
LOS Hysteresis		1			dB

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 BER less than 1E-12, OSNR > 30dB. The measure pattern is PRBS 2³¹-1.

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 – 10KΩ 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 100Ω differential lines which should be terminated with 100Ω (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 ±5% at the SFP+ connector pin. Maximum supply current is 300mA. 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. When the recommended supply-filtering network is used, hot plugging of the SFP+ transceiver module will result in an inrush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP+ transceiver

module.

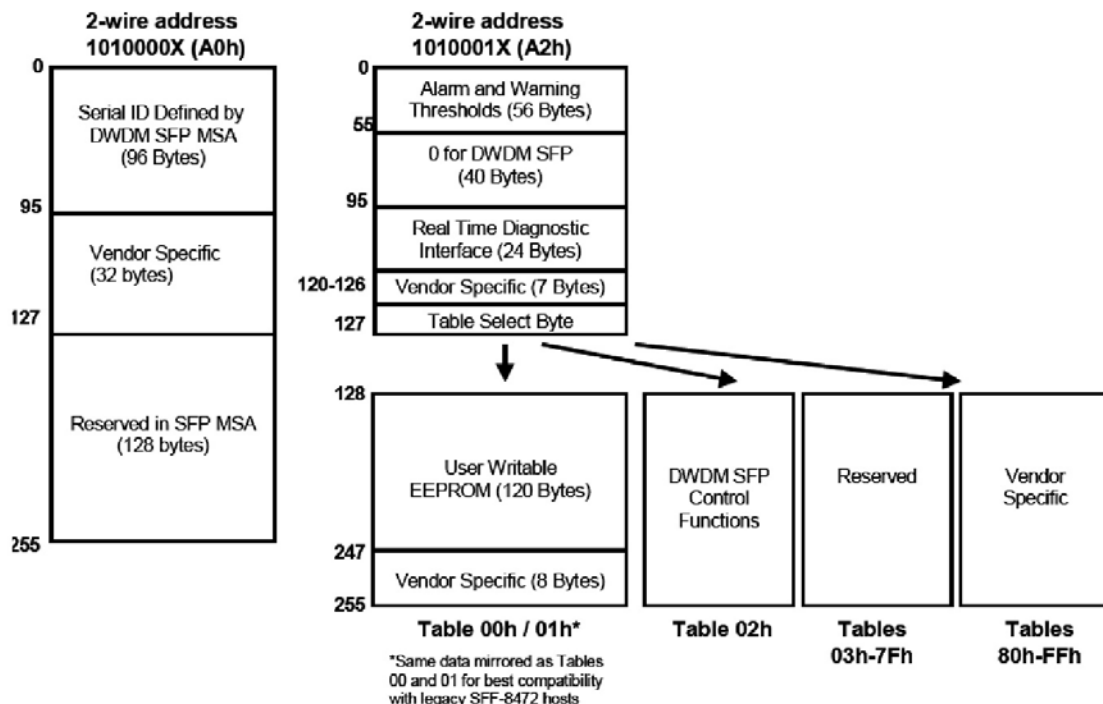
8) TD-/+ : These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board.

EEPROM

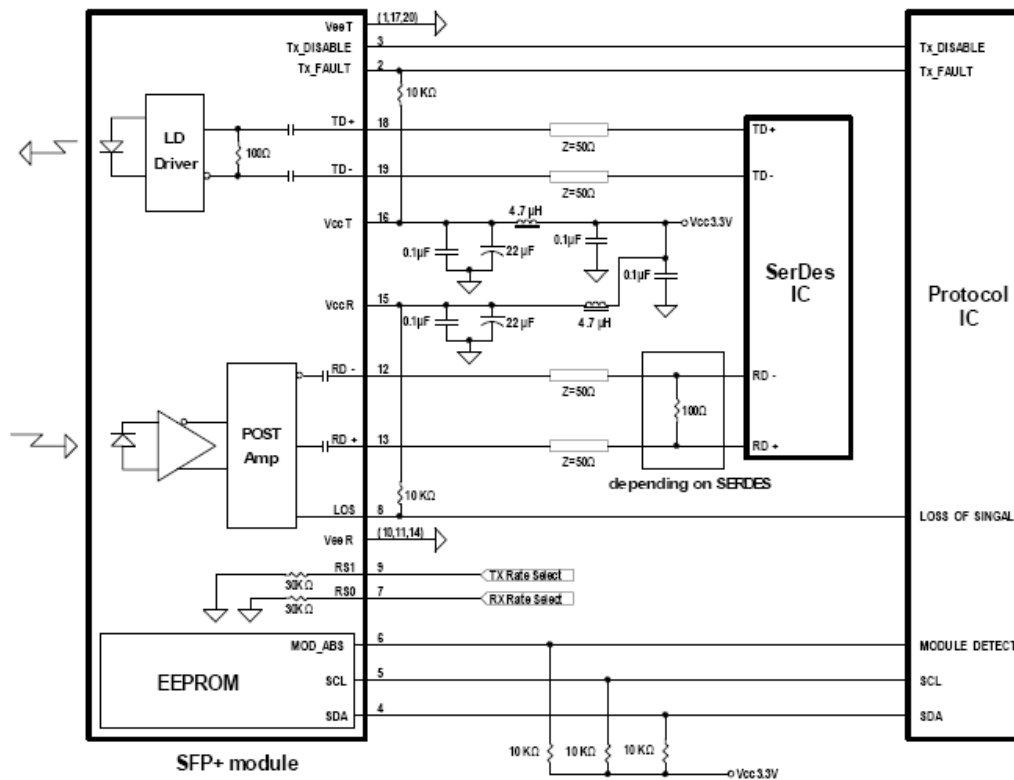
The optical transceiver contains an EEPROM. It provides access to sophisticated identification information that describes the transceiver’s capabilities, standard interfaces, manufacturer, and other information.

The serial interface uses the 2-wire serial CMOS EEPROM protocol. When the serial protocol is activated, the host generates the serial clock signal (SCL, Mod Def 1). The positive edge clocks data into those segments of the EEPROM that are not writing protected within the SFP+ transceiver. The negative edge clocks data from the SFP+ transceiver. The serial data signal (SDA, Mod Def 2) 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.

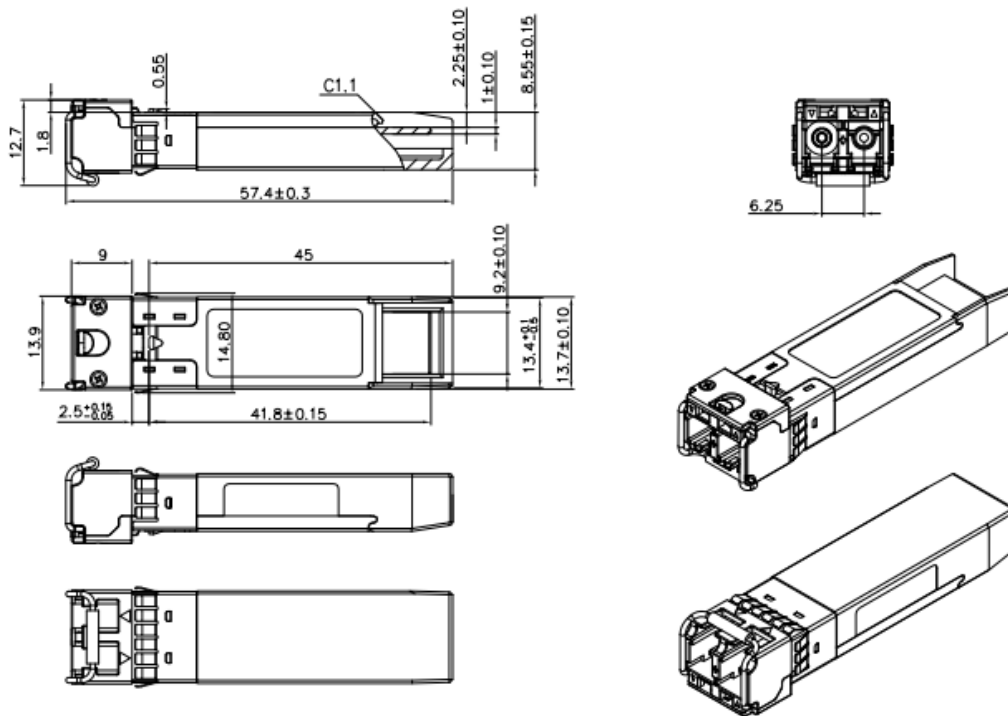
The module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Alarm/warning threshold data is written during device manufacture. TEC current monitoring, laser temperature monitoring, received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and transceiver temperature monitoring all are implemented. The diagnostic data are internal calibration and stored in memory locations 96 – 109 at wire serial bus address A2h. The transceiver memory map specific data field defines as following.



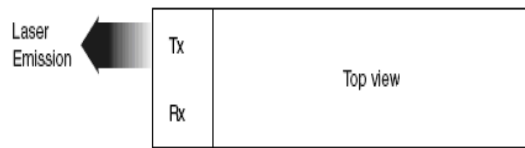
Recommend Circuit Schematic



Mechanical Specifications



Laser Emission



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	DCN	Release Date
V1.a	Abby JP.jiang	Kelly/Fing		New Released.	Mar 28, 2013
V1.b	Abby	Kelly		Correct some mistakes	May 07, 2013
V1.c	Abby, Young	Fing, Kelly		Update data rate and regulatory compliance	Sep 09, 2014
V1.d	Abby	Kelly/Vina		Update Mechanical Specifications	Feb 5, 2015
V1.e	Angela	Kelly/Vina/Fing		Add CPRI/OBSAI application and industrial temperature. Update the regulatory compliance and 2D drawing,	July 06,2015

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