

## SFP+ DWDM 16G 40Km ER

SLSSD-16XX-ER



### Features

- ◆ Supports up to 14.025Gbps bit rates
- ◆ Hot-pluggable SFP+ footprint
- ◆ 100GHz ITU, C Band DWDM Cooled EML laser and PIN photodiode, Up to 40km for SMF transmission
- ◆ Compliant with SFP+ MSA and SFF-8472 with duplex LC receptacle
- ◆ Real Time Digital Diagnostic Monitoring
- ◆ Single +3.3V power supply
- ◆ Operating case temperature: 0 to 70 °C
- ◆ RoHS Compliant

### Overview

SLSSD-16XX-ER SFP+ transceivers are high performance, cost effective modules supporting data rate of 14.025Gbps and 40km transmission distance with SMF.

The transceiver consists of three sections: a Cooled EML laser transmitter, a PIN photodiode integrated with a trans-impedance preamplifier (TIA) and MCU control unit. All modules satisfy class I laser safety requirements.

The transceivers are compatible with SFP Multi-Source Agreement and SFF-8472 digital diagnostics functions.

### Applications

- ◆ 4.25/8.5/14.025G Fibre channel
- ◆ Other Optical links

### Ordering Information

Part Number	Product Description
SLSSD-16XX-ER	SFP+ DWDM 16Gbps, XX = 17 ~ 61, ER 40km, 0°C ~ +70°C

**Note:**

[1] XX = the channel / wavelength support, available from CH17 ~ CH61, see page 5 for the wavelength guide

## Module Functional Diagram

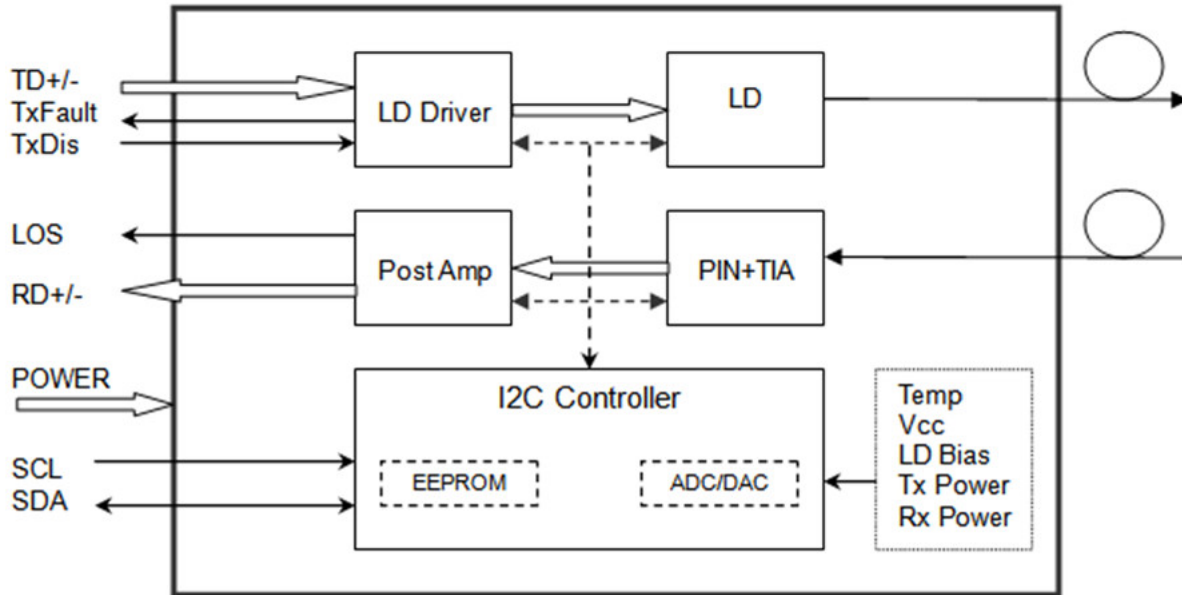


Figure1. Module Functional Diagram

## Absolute Maximum rating

Parameters	Symbol	Min.	Max.	Unit
Power Supply Voltage	V <sub>CC</sub>	-0.5	4.5	V
Storage Temperature	T <sub>c</sub>	-40	85	°C
Relative Humidity	RH	5	85	%

## Recommended Operating Condition

Parameter	Symbol	Min.	Typical	Max	Unit
Operating Case Temperature	T <sub>c</sub>	0		70	°C
Power Supply Voltage	V <sub>CC</sub>	3.135	3.30	3.465	V
Power Supply Current	I <sub>CC</sub>			550	mA
Data Rate		4.25	14.025		Gb/s

## Optical and Electrical Characteristics

Parameter	Symbol	Min	Typical	Max	Unit	Notes
<b>Transmitter</b>						
Centre Wavelength	$\lambda_c$	1528.77		1563.05	nm	
Spectral Width (-20dB)	$\Delta\lambda$			1	nm	
Side-Mode Suppression Ratio	SMSR	30	-		dB	

**Datasheet**

Average Output Power	$P_{out}$	-1		+3	dBm	1
Extinction Ratio	ER	6.0			dB	
Data Input Swing Differential	$V_{IN}$	180		850	mV	2
Input Differential Impedance	$Z_{IN}$	90	100	110	$\Omega$	
TX Disable	Disable	2.0		Vcc	V	
	Enable	0		0.8	V	
TX Fault	Fault	2.0		Vcc	V	
	Normal	0		0.8	V	
<b>Receiver</b>						
Centre Wavelength	$\lambda_c$	1260		1620	nm	
Receiver Sensitivity				-14	dBm	3
Receiver Overload		0.5			dBm	3
LOS De-Assert	LOS <sub>D</sub>			-15	dBm	
LOS Assert	LOS <sub>A</sub>	-28			dBm	
LOS Hysteresis		0.5			dB	
Data Output Swing Differential	$V_{OUT}$	300		900	mV	4
LOS	High	2.0		Vcc	V	
	Low			0.8	V	

**Notes:**

1. The optical power is launched into SMF.
2. PECL input, internally AC-coupled and terminated.
3. Measured with a PRBS  $2^{31}-1$  test pattern @14025Mbps, BER  $\leq 1 \times 10^{-12}$ .
4. Internally AC-coupled.

**Timing and Electrical**

Parameter	Symbol	Min	Typical	Max	Unit
Tx Disable Negate Time	t <sub>on</sub>			2	ms
Tx Disable Assert Time	t <sub>off</sub>			100	$\mu$ s
Time To Initialize, including Reset of Tx Fault	t <sub>init</sub>			300	ms
Tx Fault Assert Time	t <sub>fault</sub>			100	$\mu$ s
Tx Disable To Reset	t <sub>reset</sub>	10			$\mu$ s
LOS Assert Time	t <sub>loss_on</sub>			100	$\mu$ s
LOS De-assert Time	t <sub>loss_off</sub>			100	$\mu$ s
Serial ID Clock Rate	f <sub>serial_clock</sub>		100	400	KHz
MOD_DEF (0:2)-High	V <sub>H</sub>	2		Vcc	V
MOD_DEF (0:2)-Low	V <sub>L</sub>			0.8	V

## Diagnostics

Parameter	Range	Unit	Accuracy	Calibration
Temperature	0 to +70	°C	±3°C	Internal
Voltage	3.0 to 3.6	V	±3%	Internal
Bias Current	0 to 100	mA	±10%	Internal
TX Power	-1 to +3	dBm	±3dB	Internal
RX Power	-16 to -1	dBm	±3dB	Internal

### Digital Diagnostic Memory Map

The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

The digital diagnostic memory map specific data field defines as following.

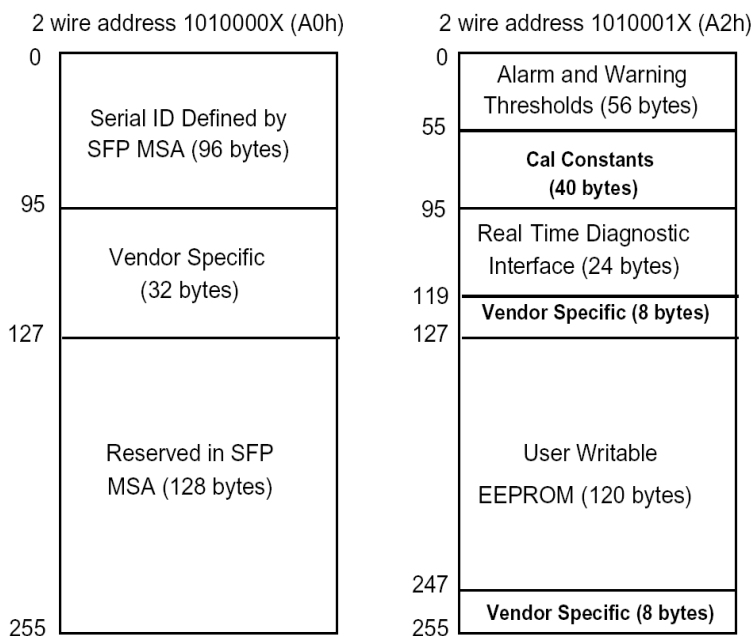


Figure2. Digital Diagnostic Memory Map

## C-band $\lambda$ C Wavelength Guide

$\lambda$ C Wavelength Guide					
ITU Channel Product Code	Frequency(THz)	Wavelength	ITU Channel Product Code	Frequency(THz)	Wavelength
17	191.7	1563.86	40	194.0	1545.32
18	191.8	1563.04	41	194.1	1544.52
19	191.9	1562.23	42	194.2	1543.73
20	192.0	1561.41	43	194.3	1542.93
21	192.1	1560.60	44	194.4	1542.14
22	192.2	1559.79	45	194.5	1541.34
23	192.3	1558.98	46	194.6	1540.55
24	192.4	1558.17	47	194.7	1539.76
25	192.5	1557.36	48	194.8	1538.97
26	192.6	1556.55	49	194.9	1538.19
27	192.7	1555.74	50	195.0	1537.40
28	192.8	1554.94	51	195.1	1536.61
29	192.9	1554.13	52	195.2	1535.82
30	193.0	1553.32	53	195.3	1535.04
31	193.1	1552.52	54	195.4	1534.25
32	193.2	1551.72	55	195.5	1533.46
33	193.3	1550.92	56	195.6	1532.68
34	193.4	1550.11	57	195.7	1531.89
35	193.5	1549.32	58	195.8	1531.12
36	193.6	1548.51	59	195.9	1530.33
37	193.7	1547.71	60	196.0	1529.55
38	193.8	1546.92	61	196.1	1528.77
39	193.9	1546.12	-	-	-

## Pin Definition

Pin	Signal Name	Description	Plug Seq.	Notes
1	V <sub>EET</sub>	Transmitter Ground	1	
2	TX FAULT	Transmitter Fault Indication	3	1
3	TX DISABLE	Transmitter Disable	3	2
4	SDA	SDA Serial Data Signal	3	
5	SCL	SCL Serial Clock Signal	3	
6	MOD_ABS	Module Absent. Grounded within the module	3	
7	RS0	Not Connected	3	
8	LOS	Loss of Signal	3	3
9	RS1	Not Connected	3	
10	V <sub>EER</sub>	Receiver ground	1	
11	V <sub>EER</sub>	Receiver ground	1	
12	RD-	Inv. Received Data Out	3	4
13	RD+	Received Data Out	3	4
14	V <sub>EER</sub>	Receiver ground	1	
15	V <sub>CCR</sub>	Receiver Power Supply	2	
16	V <sub>CCT</sub>	Transmitter Power Supply	2	
17	V <sub>EET</sub>	Transmitter Ground	1	
18	TD+	Transmit Data In	3	5
19	TD-	Inv. Transmit Data In	3	5
20	V <sub>EET</sub>	Transmitter Ground	1	

### Notes:

Plug Seq.: Pin engagement sequence during hot plugging.

- TX Fault is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and V<sub>cc</sub>+0.3V. Logic 0 indicates normal operation; Logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 0.8V.
- Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
- LOS is open collector output. Should be pulled up with 4.7k~10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.
- RD-/+ : These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential) at the user SERDES.
- TD-/+ : These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.

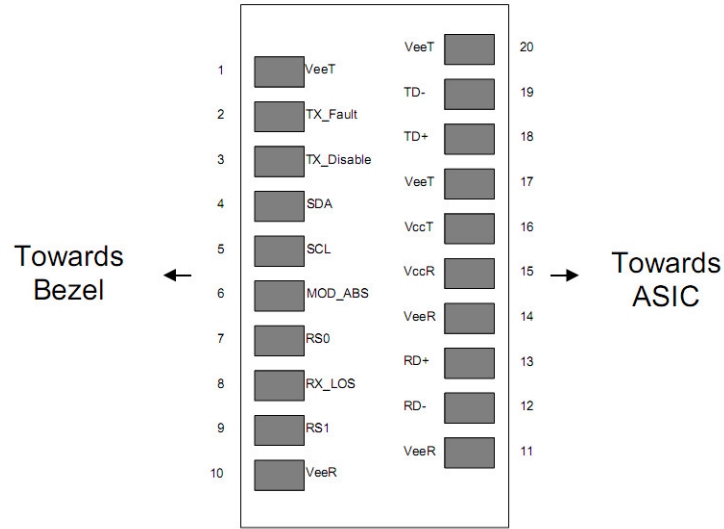


Figure3. Electrical Pin-out Details

### Recommended Interface Circuit

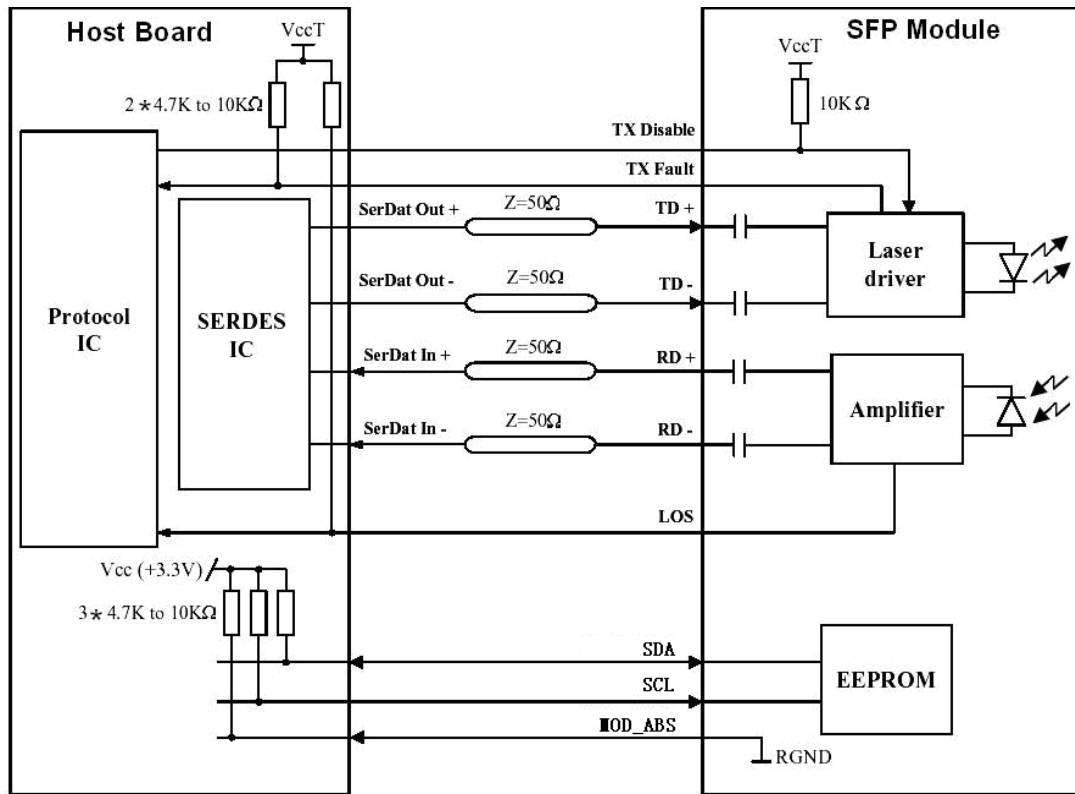


Figure4. Recommended Interface Circuit

Mechanical Specifications

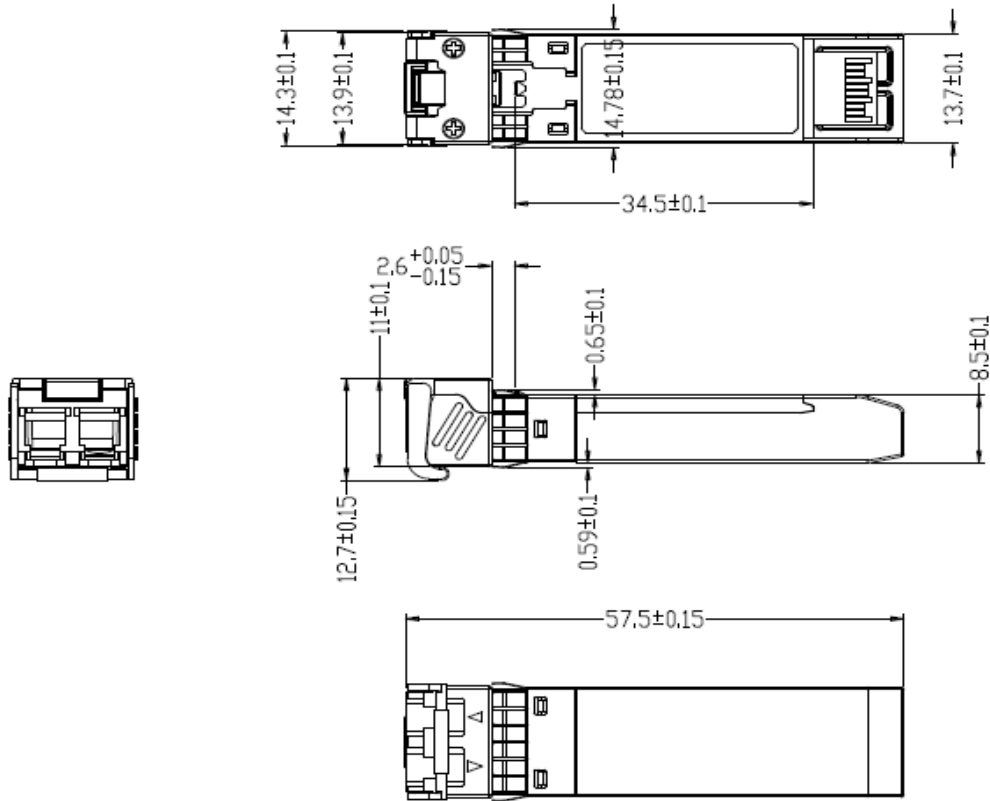


Figure5. Mechanical Specifications

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