ESDxx12-G0D(I)

1.25Gbps DWDM SFP Optical Transceiver, 160KM Reach

PRODUCT FEATURES

- **Up to 1.25Gb/s data links**
- **DWDM DML laser transmitter and APD photo-detector**
- **100 GHz ITU channel spacing with integrated wavelength locker**
- **Up to 160km on 9/125um SMF**
- **Hot-pluggable SFP footprint**
- **Duplex LC/UPC type pluggable optical interface**
- **Low power dissipation**
- **RoHS-10 compliant and lead-free**
- **Support Digital Monitoring interface**
- **Single +3.3V power supply**
- **Compliant with SFF-8472**
- **Metal enclosure, for lower EMI**
- **Meet ESD requirements, resist 8KV direct contact voltage**
- **Case operating temperature**

  Commercial: 0 ~ +70oC

  Extended: -10 ~ +80oC

  Industrial: -40 ~ +85oC

APPLICATIONS

- **SONET/SDH networks**
- **Gigabit Ethernet**
- **C Band DWDM networks**
- **Fiber Channel**
- **Other Optical Links**

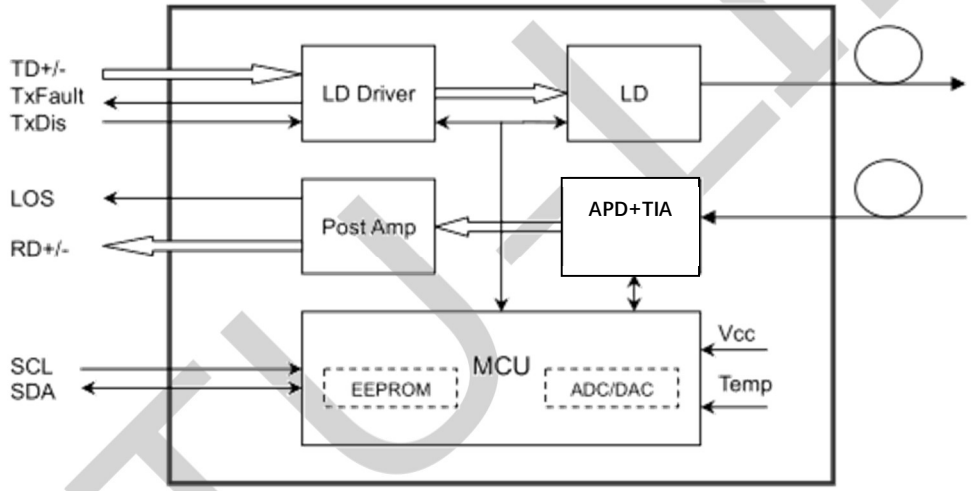
DESCRIPTIONS

ETU-Link DWDM SFP transceivers include and APD photo-detector diode and temperature stabilized DWDM DML transmitter. Digital diagnostic functions are available via an I2C.This module is designed for single mode fiber and operates at a nominal wavelength of 100GHz ITU Grid, C Band DWDM wavelength. Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472.

The optical output can be disabled by a TTL logic high-level input of Tx Disable, and the system also can disable the module via I2C. Tx Fault is provided to indicate that degradation of the laser.

Loss of signal (LOS) output is provided to indicate the loss of an input optical signal of receiver or the link status with partner. The system can also get the LOS (or Link)/Disable/Fault information via I2C register access.

Module Block Diagram



Ordering Information

Part No.	Data Rate(optical)	Laser	Fiber Type	Distance	Optical Interface	Temp	DDMI
ESDxx12-G0D	1.25Gbps	EML	SMF	160KM	LC	0~70℃	Y
ESDxx12-G0D(I)	1.25Gbps	EML	SMF	160KM	LC	-40~85℃	Y

Wavelength Selection: C-band λc Wavelength Guide Pin Descriptions

Code	Frequency (THz)	Center Wavelength(nm)	Code	Frequency (THz)	Center Wavelength(nm)
17	1563.86	191.70	39	1546.12	193.90
18	1563.05	191.80	40	1545.32	194.00
19	1562.23	191.90	41	1544.53	194.10
20	1561.42	192.00	42	1543.73	194.20
21	1560.61	192.10	43	1542.94	194.30
22	1559.79	192.20	44	1542.14	194.40
23	1558.98	192.30	45	1541.35	194.50
24	1558.17	192.40	46	1540.56	194.60
25	1557.36	192.50	47	1539.77	194.70
26	1556.55	192.60	48	1538.98	194.80
27	1555.75	192.70	49	1538.19	194.90
28	1554.94	192.80	50	1537.40	195.00
29	1554.13	192.90	51	1536.61	195.10
30	1553.33	193.00	52	1535.82	195.20
31	1552.52	193.10	53	1535.04	195.30
32	1551.72	193.20	54	1534.25	195.40
33	1550.92	193.30	55	1533.47	195.50
34	1550.12	193.40	56	1532.68	195.60
35	1549.32	193.50	57	1531.90	195.70
36	1548.51	193.60	58	1531.12	195.80
37	1547.72	193.70	59	1530.33	195.90
38	1546.92	193.80	60	1529.55	196.00
Non-ITU	Peak wavelength between 1528.77nm-1563.86		61	1528.77	196.10

Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit	Ref.

Storage Temperature	T_S	-40		85	°C	
Power Supply Voltage	V_{CC}	-0.5		3.6	V	
Relative Humidity (non-condensation)	RH	5		95	%	
Damage Threshold	TH_d	0			dBm	

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Case Temperature	T_{OP}	0		70	°C	commercial
		-10		80		extended
		-40		85		Industrial
Power Supply Voltage	V_{CC}	3.135	3.3	3.465	V	
Data Rate			1.25		Gb/s	
Control Input Voltage High		2		Vcc	V	
Control Input Voltage Low		0		0.8	V	
Link Distance (SMF)	D			160	km	9/125um

Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Power Consumption	P			1.5	W	commercial
				1.8		Industrial
Supply Current	Icc			450	mA	commercial
				545		Industrial
Transmitter						
Single-ended Input Voltage Tolerance	VCC	-0.3		4.0	V	
Differential Input Voltage Swing	Vin,pp	200		2400	mV pp	
Differential Input Impedance	Zin	90	100	110	Ohm	
Transmit Disable Assert Time				5	us	
Transmit Disable Voltage	Vdis	Vcc-1.3		Vcc	V	

Transmit Enable Voltage	Ven	Vee-0.3		0.8	V	
Receiver						
Differential Output Voltage Swing	Vout,pp	500		900	mV pp	
Differential Output Impedance	Zout	90	100	110	Ohm	
Data output rise/fall time	Tr/Tf		100	260	ps	20% to 80%
LOS Assert Voltage	VlosH	Vcc-1.3		Vcc	V	
LOS De-assert Voltage	VlosL	Vee-0.3		0.8	V	

Optical and Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Transmitter						
Center Wavelength	λC	λc -0.1		λc +0.1	nm	1
Center Wavelength Spacing			100		GHz	
Spectrum Bandwidth (RMS)	σ			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Average Optical Power	PAVG	1		6	dBm	2
Extinction Ratio	ER	9			dB	
Transmitter OFF Output Power	Poff			-45	dBm	
Transmitter Eye Mask	Compliant with 802.3z(class 1 laser safety)					
Receiver						
Center Wavelength	λC	1270		1610	nm	
Sensitivity (Average Power)	Sen.			-33	dBm	3
Input Saturation Power (overload)	Psat	-10			dBm	
LOS Assert	LOSA	-41			dBm	4
LOS De-assert	LOSD			-34	dBm	4
LOS Hysteresis	LOSH	0.5			dB	

Note:

1. λc refer to wavelength selection, and corresponds to approximately 0.8 nm.
2. Measure at 2^7-1 NRZ PRBS pattern.

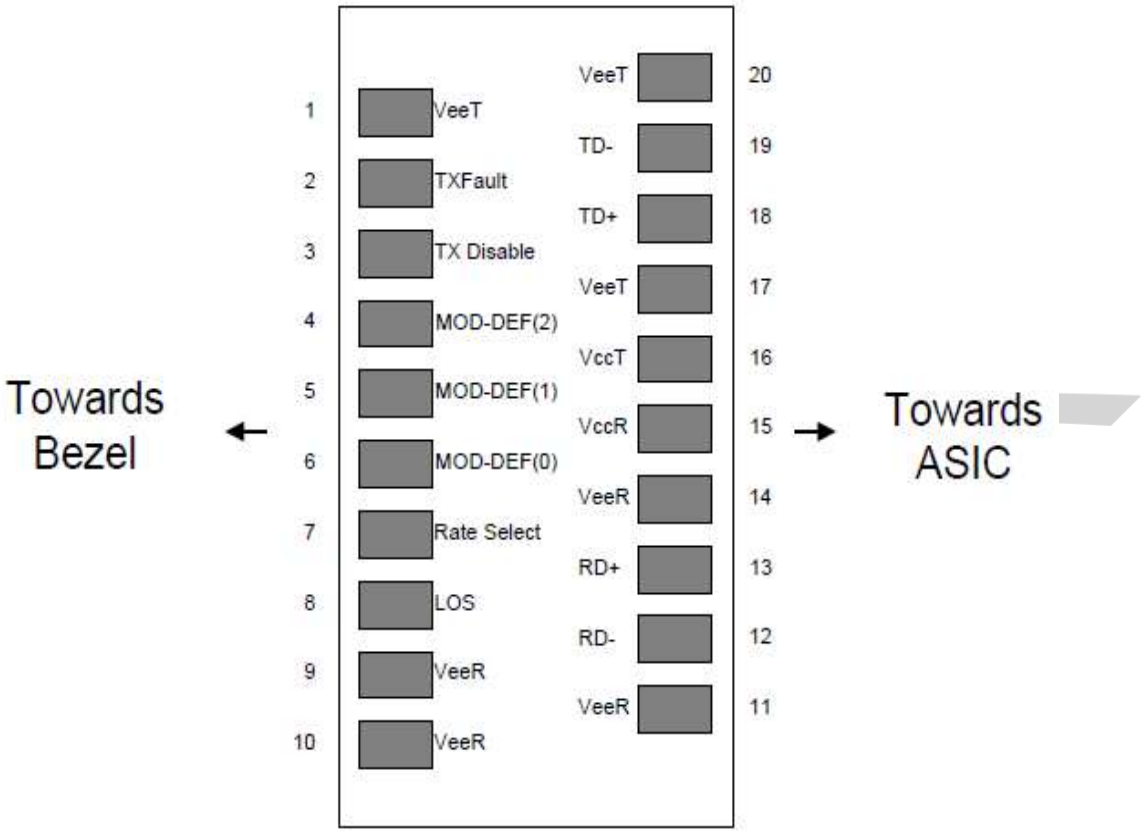
3. Measured with Light source 1563.86~1528.77nm, ER=9dB; BER≤1E-12 @PRBS=2^7-1 NRZ.

4. When LOS de-asserted, the RX data+/- output is High-level (fixed).

Digital Diagnostics

Parameter	Symbol	Min.	Max	Unit	Notes
Temperature monitor absolute error	DMI_ Temp	-3	3	°C	Over operating temp
Supply voltage monitor absolute error	DMI _VCC	-0.15	0.15	V	Full operating range
RX power monitor absolute error	DMI_RX	-3	3	dB	
Bias current monitor	DMI_ bias	-10%	10%	mA	
TX power monitor absolute error	DMI_TX	-3	3	dB	

Pin Diagram



Pin Definitions

Pin	Symbol	Name/Description	Ref.
1	VEET	Transmitter Ground (Common with Receiver Ground)	1
2	TXFAULT	Transmitter Fault.	
3	TXDIS	Transmitter Disable. Laser output disabled on high or open.	2
4	MOD_DEF (2)	Module Definition 2. Data line for Serial ID.	3
5	MOD_DEF (1)	Module Definition 1. Clock line for Serial ID.	3
6	MOD_DEF (0)	Module Definition 0. Grounded within the module.	3
7	Rate Select	No connection required	4
8	LOS	Loss of Signal indication Logic 0 indicates normal operation.	5
9	VEER	Receiver Ground (Common with Transmitter Ground)	1
10	VEER	Receiver Ground (Common with Transmitter Ground)	1
11	VEER	Receiver Ground (Common with Transmitter Ground)	1
12	RD-	Receiver Inverted DATA out. AC Coupled	

13	RD+	Receiver Non-inverted DATA out. AC Coupled	
14	VEER	Receiver Ground (Common with Transmitter Ground)	1
15	VCCR	Receiver Power Supply	
16	VCCT	Transmitter Power Supply	
17	VEET	Transmitter Ground (Common with Receiver Ground)	1
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	
19	TD-	Transmitter Inverted DATA in. AC Coupled.	
20	VEET	Transmitter Ground (Common with Receiver Ground)	1

Notes:

1. Circuit ground is internally isolated from chassis ground.
2. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
3. Should be pulled up with 4.7k-10k ohms on host board to a voltage between 2.0V and 3.6V.MOD_DEF (0) pulls line low to indicate module is plugged in.
4. This is an optional input used to control the receiver bandwidth for compatibility with multiple data rates (most likely Fiber Channel 1x and 2x Rates). If implemented, the input will be internally pulled down with > 30kΩ resistor. The input states are:

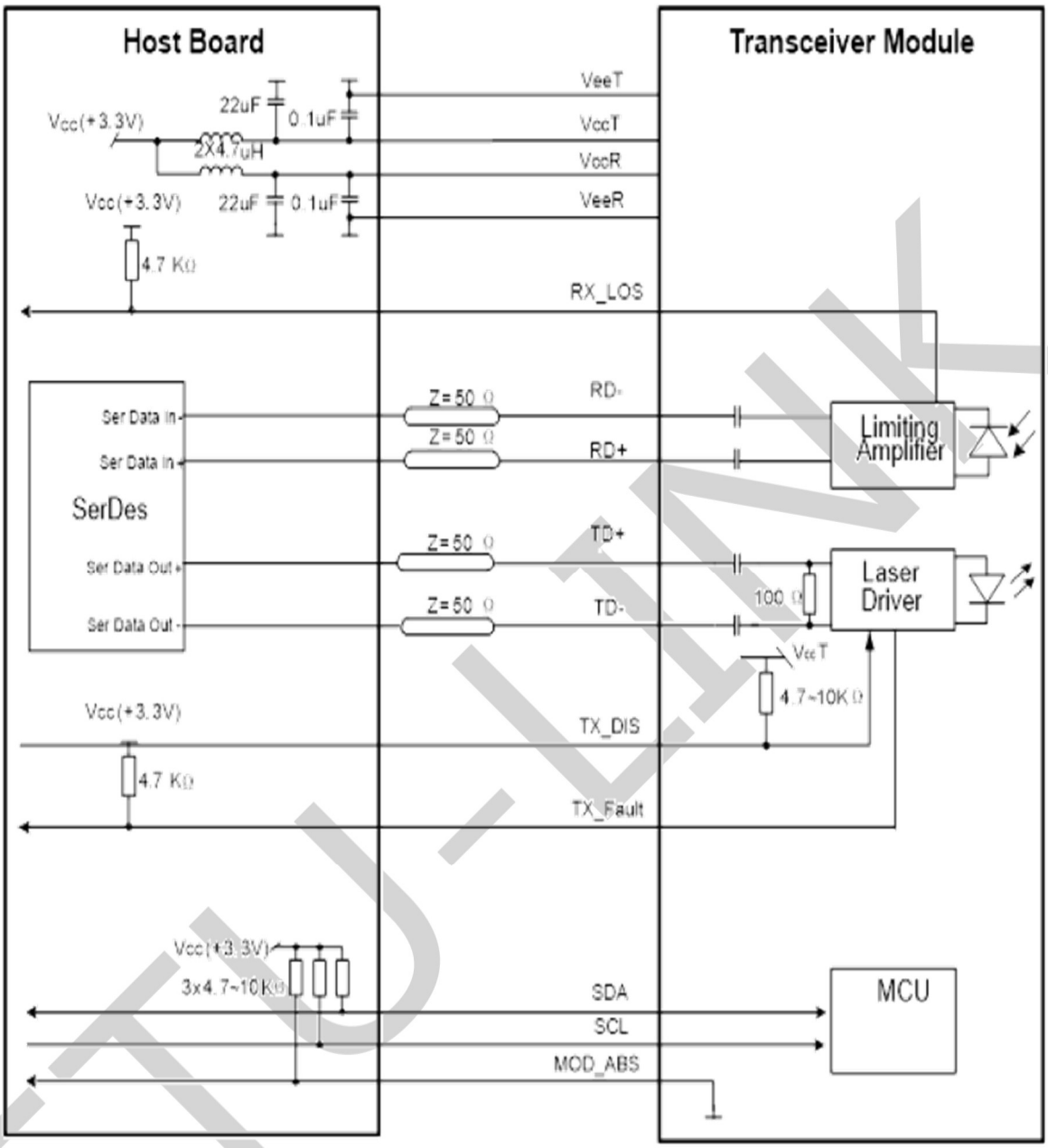
   1) Low (0 – 0.8V): Reduced Bandwidth 2) (>0.8, <

   2.0V):Undefined

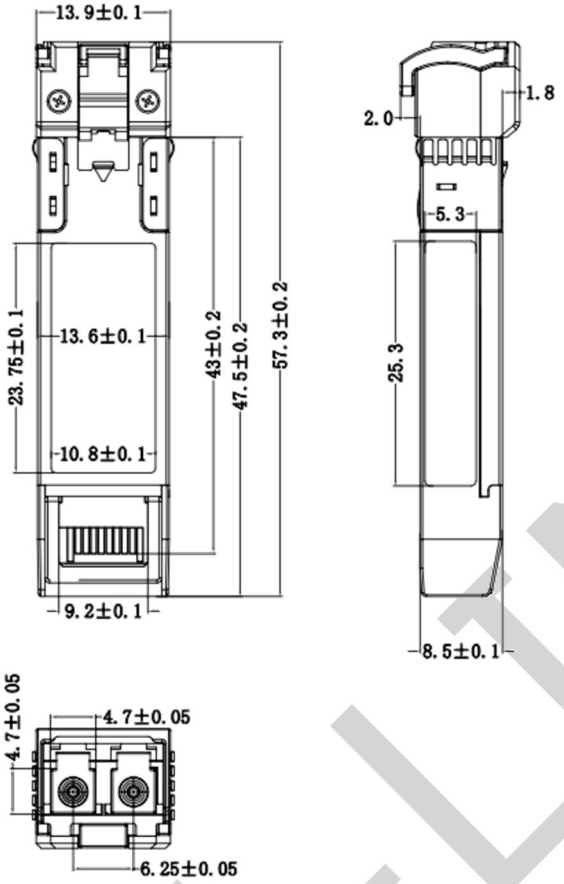
   High (2.0 – 3.465V): Full Bandwidth

   Open: Reduced Bandwidth
5. LOS is open collector output should be pulled up with 4.7k-10k ohms on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

Recommended Interface Circuit



Mechanical Diagram



Revision History

Version No.	Date	Description
1.0	February 18, 2016	Preliminary datasheet
2.0	September 28,2023	Product upgrades
3.0	July 26, 2024	Format change

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