

ESCxx12-20D(I)

1.25Gbps CWDM SFP Optical Transceiver 20KM Reach

PRODUCT FEATURE

- Data-rate of 1.25Gbps operation
- 18 CWDM DFB wavelengths laser and PIN photodetector for 20km transmission
- Compliant with SFP MSA and SFF-8472 with duplex LC receptacle
- Digital Diagnostic Monitoring:
- Internal Calibration or External Calibration
- Compatible with SONET OC-24-LR-1
- Compatible with RoHS
- +3.3V single power supply
- Operating case temperature:
- Commercial Temperature: 0 to +70°C
- Industrial Temperature: -40 to +85°C



Applications

- Gigabit Ethernet
- Fiber Channel
- Switch to Switch interface
- Switched backplane applications
- Router/Server interface
- Other optical transmission systems

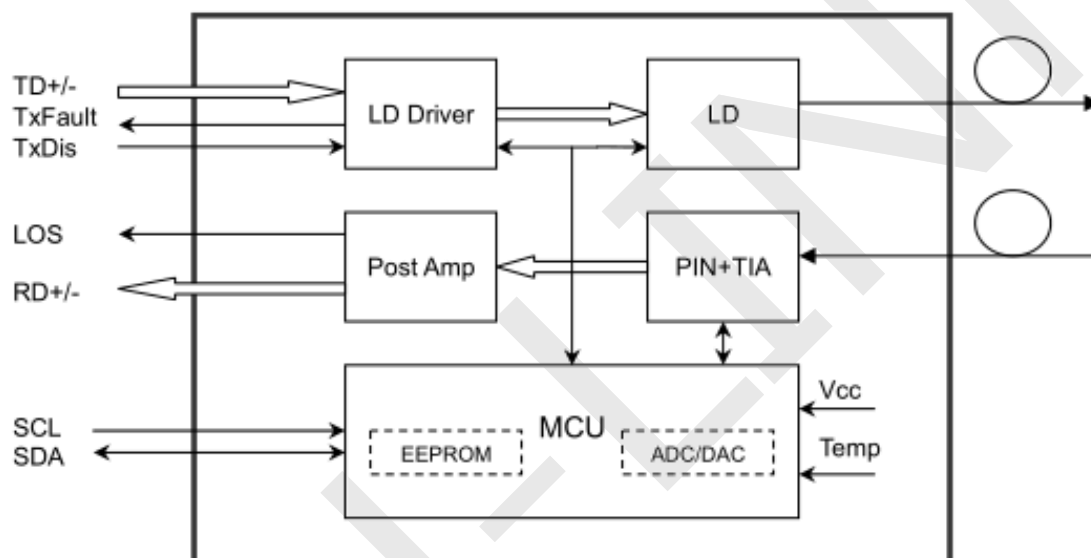
Description

The SFP transceivers are high performance, cost effective modules supporting data-rate of 1.25Gbps and 20KM transmission distance with SMF.

The transceiver consists of three sections: an uncooled CWDM DFB 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 (MSA) and SFF-8472. For further information, please refer to SFP MSA.

Module Block Diagram



Ordering Information

Part No.	Data Rate(optical)	Laser	Fiber Type	Distance	Optical Interface	Temp	DDMI
ESCxx12-20D	1.25Gbps	DFB	SMF	20km	LC	0~70°C	Y
ESCxx12-20DI	1.25Gbps	DFB	SMF	20km	LC	-40~85°C	Y

Wavelength Selection: C λc Wavelength

Wavelength	xx	Clasp Color Code	Wavelength	xx	Clasp Color Code
1270 nm	27	Gray	1450 nm	45	Brown
1290 nm	29	Gray	1470 nm	47	Gray
1310 nm	31	Gray	1490 nm	49	Purple

1330 nm	33	Purple	1510 nm	51	Blue
1350 nm	35	Blue	1530 nm	53	Green
1370 nm	37	Green	1550 nm	55	Yellow
1390 nm	39	Yellow	1570 nm	57	Orange
1410 nm	41	Orange	1590 nm	59	Red
1430 nm	43	Red	1610 nm	61	Brown

Absolute Maximum Ratings

It has to be noted that the operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min	Max	Unit	Notes
Storage Temperature	T _s	-40	85	°C	
Operating Case Temperature	T _{case}	See order Information		°C	
Power Supply Voltage	V _{CC}	-0.5	3.6	V	
Relative Humidity (non-condensation)	RH	5	95	%	

Recommended Operating Conditions and Power Supply Requirements

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Operating Case Temperature	T _{OP}	0		70	°C	Commercial
		-40		85		Industrial
Power Supply Voltage	V _{CC}	3.135	3.3	3.465	V	
Power Supply Current	ICC			300	mA	
Data Rate			1250		Mb/s	
Control Input Voltage High		2		V _{CC}	V	
Control Input Voltage Low		0		0.8	V	
Link Distance (SMF)	D			20	km	9/125um

Electrical Characteristics

High-Speed Signal: Compliant to CEI-11G-SR
Low-Speed Signal: Compliant to SFF-8419

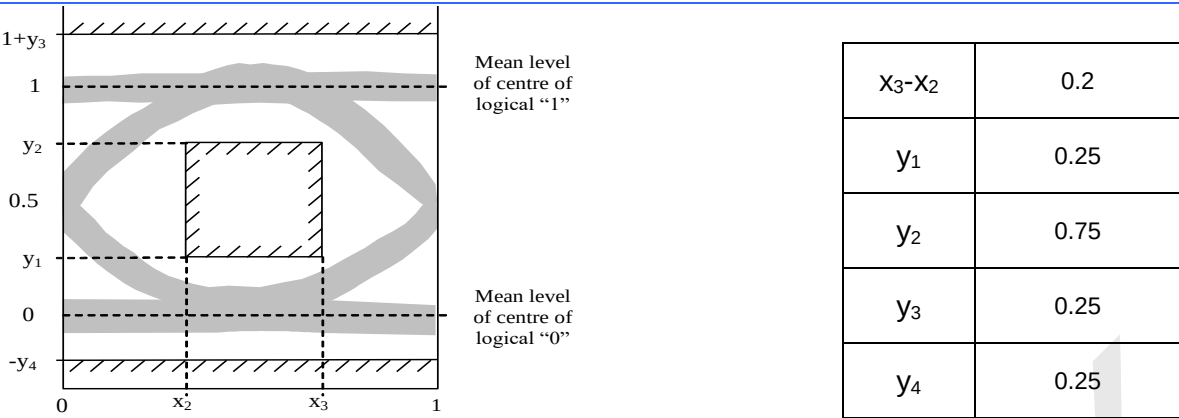
Parameter		Symbol	Min.	Typical	Max.	Unit	Notes
Transmitter (Module Input)							
Differential Input Resistance		R _{Rdin}	80	100	120	Ω	
Input Differential Voltage		R _{Vdiff}	110	-	1050	mVpp	
Tx_Disable	Normal Operation	V _{IL}	-0.3	-	0.8	V	
	Laser Disable	V _{IH}	2.0	-	V _{CC} +0.3	V	
Receiver (Module Output)							
Differential Resistance		T _{Rd}	80	100	120	Ohm	
Output Differential Voltage		T _{Vdiff}	360	-	770	mVpp	
Differential Termination Resistance Mismatch		T _{Rdm}	-	-	5	%	
Rx los	Normal Operation	V _{OL}	-0.3	-	0.4	V	
	Loss Signal	V _{OH}	2		V _{CC} H _{OST}	V	

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Transmitter						
Average Output Power	POUT	-9		-3	dBm	1
Extinction Ratio	ER	8.2			dB	
Center Wavelength	λ_C	$1XX0-\Delta\lambda$	$1XX0$	$1XX0+\Delta\lambda$	nm	2
Side Mode Suppression Ratio	SMSR	30			dB	
Spectrum Bandwidth(-20dB)	σ			1	nm	
Transmitter OFF Output Power	POff			-45	dBm	
Differential Line Input Impedance	RIN	90	100	110	Ohm	
Output Eye Mask	Compliant with G.957 (class 1 laser safety)					3
Receiver						
Input Optical Wavelength	λ_{IN}	1270		1610	nm	
Receiver Sensitivity	PIN			-24	dBm	4
Input Saturation Power (Overload)	PSAT	-9			dBm	
Los Of Signal Assert	PA	-35			dBm	
Los Of Signal De-assert	PD			-24	dBm	5
LOS Hysteresis	PA-PD	0.5	2	6	dB	

Note:

1. Measure at 2¹⁷-1 NRZ PRBS pattern
2. "XX" is 27,29,31,33,35,37,39,41,43,45,47,49,51,53,55,57,59 and 61; "Δλ" is 7.5
3. Transmitter eye mask definition



4. Measured with Light source 1XX0 nm, ER=8.2dB; BER =<10⁻¹² @PRBS=2⁷-1 NRZ ,
5. When LOS de-asserted, the RX data+/- output is High-level (fixed)

Digital Diagnostic

Parameter	Range	Accuracy	Unit	Calibration
Temperature	-40 to 85	±3	°C	Internal
Voltage	0 to Vcc	±3%	V	Internal
Tx Bias Current	0 to 100	±10%	mA	Internal
Tx Output Power	-9 to -3	±3	dB	Internal
Rx Input Power	-24 to -3	±3	dB	Internal

Pin Assignment

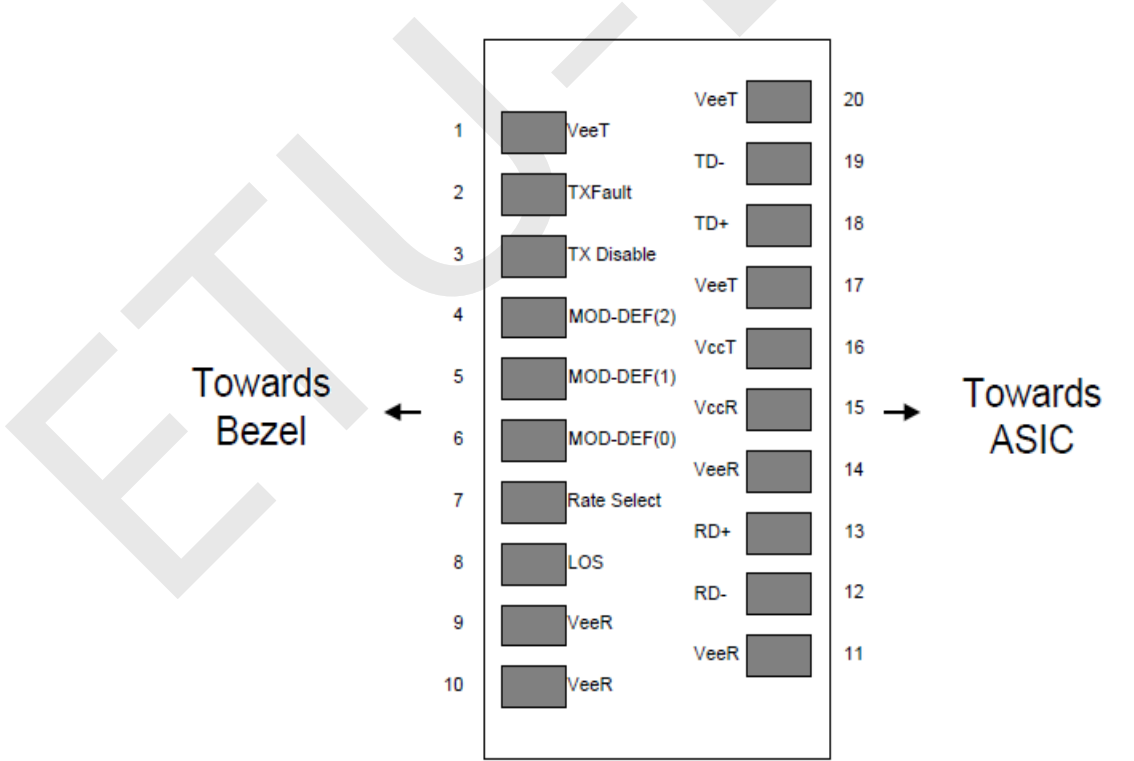


Figure1. Diagram of host board connector block pin numbers and names

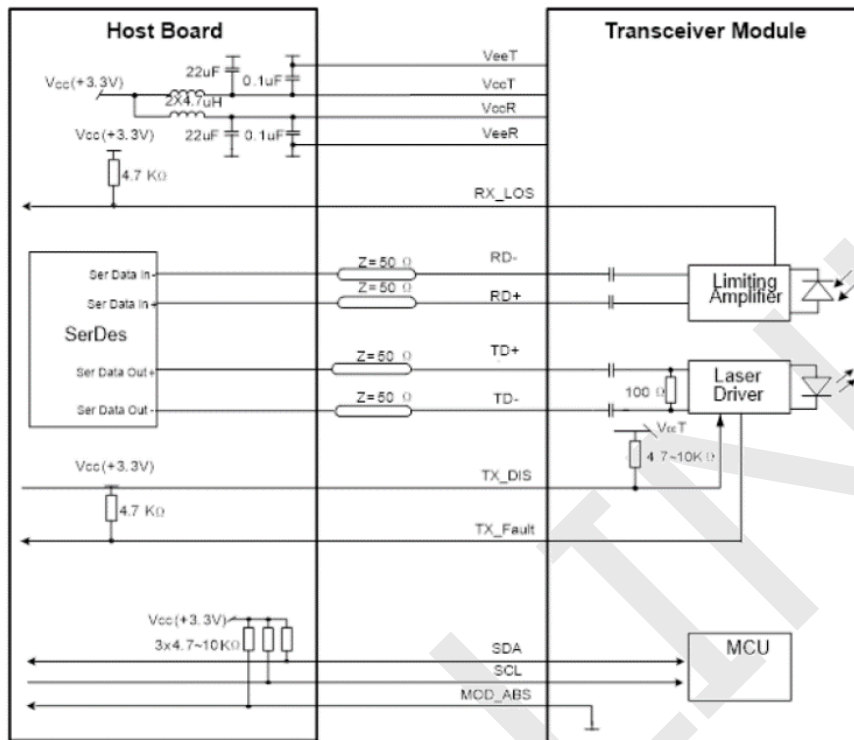
Pin Description

PIN	Name	Name/Description	Notes
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

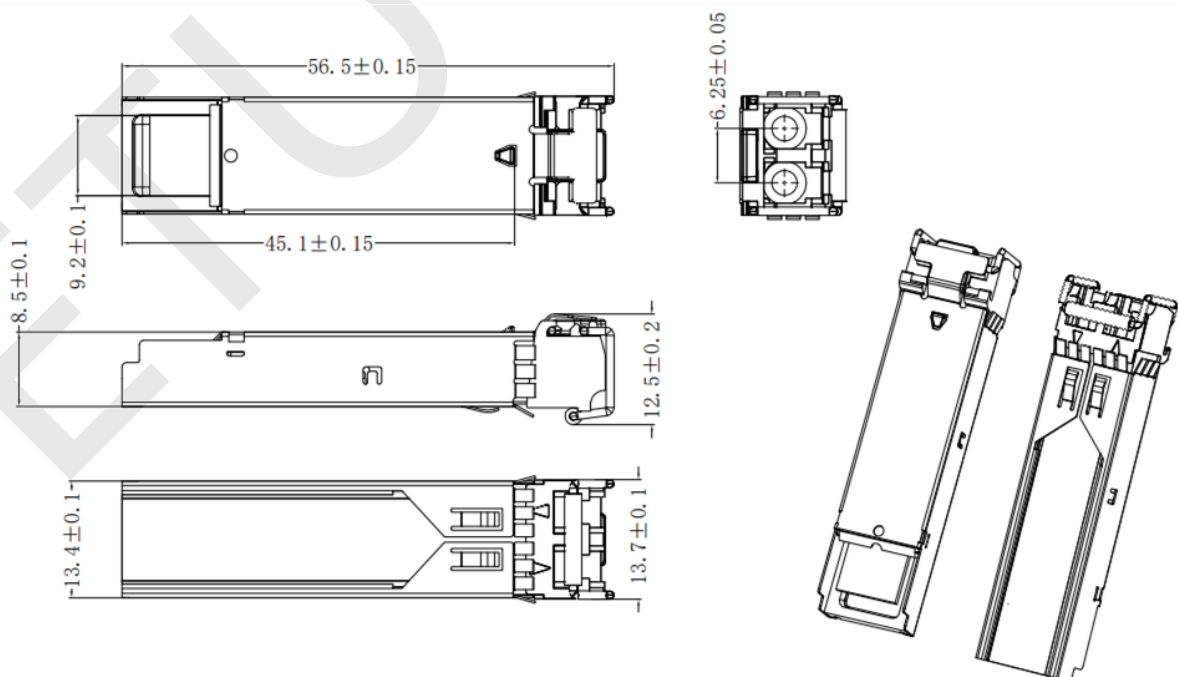
Notes:

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
 - 3) High (2.0 – 3.465V): Full Bandwidth
 - 4) 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 Dimensions



Revision History

Version No.	Date	Description
1.0	February 12, 2014	Preliminary datasheet
2.0	October 02, 2017	Product upgrades
3.0	July 27, 2024	Format change

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