

ESCxx24-C0D(I)

2.5Gbps CWDM 120KM SFP+ Transceiver

PRODUCT FEATURES

- Up to 2.5Gb/s data links
- CWDM DFB laser transmitter and APD photo-detector
- Up to 120km 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°C ~70°C
 - Extended: -10°C ~80°C
 - Industrial: -40°C ~85°C

APPLICATIONS

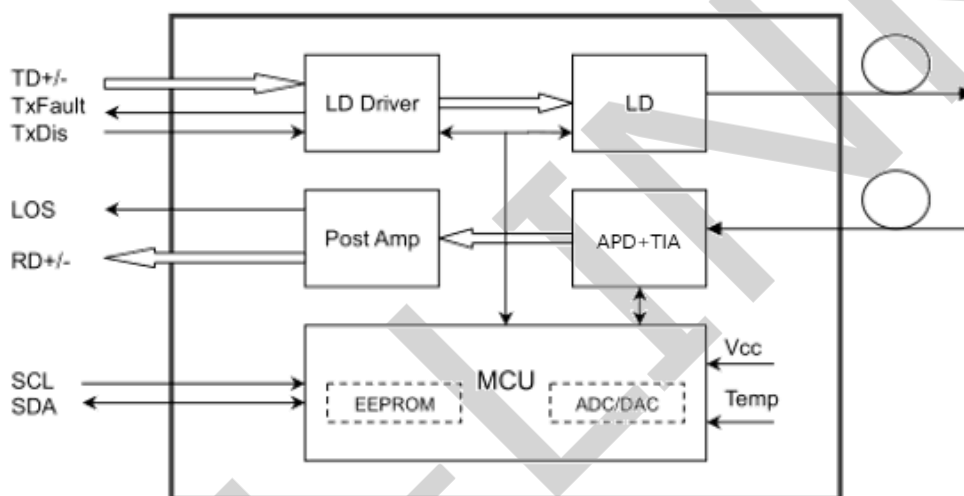
- Switch to Switch Interface
- Gigabit Ethernet
- Switched Backplane Applications
- Router/Server Interface
- Other Optical Links

DESCRIPTIONS

Small Form Factor Pluggable (SFP) transceivers are compatible with the Small Form Factor Pluggable Multi-Sourcing Agreement (MSA). The transceiver consists of five sections: the LD driver, the limiting amplifier, the digital diagnostic monitor, the CWDM DFB laser and the APD photo-detector. The module data link up to 80km in 9/125um single mode fiber.

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
ESCxx24-C0D	2.5Gbps	CWDM	SMF	120km	LC	0~70℃	Y
ESCxx24-C0DI	2.5Gbps	CWDM	SMF	120km	LC	-10~80℃	Y
ESCxx24-CDE	2.5Gbps	CWDM	SMF	120km	LC	-40~85℃	Y

Wavelength Guide Pin Descriptions

Wavelength	x	Clasp Color Code	Wavelength	x	Clasp Color Code
1270	27	Gray	1450	45	Brown
1290	29	Gray	1470	47	Gray
1310	31	Gray	1490	49	Purple
1330	33	Purple	1510	51	Blue

1350	35	Blue	1530	53	Green
1370	37	Green	1550	55	Yellow
1390	39	Yellow	1570	57	Orange
1410	41	Orange	1590	59	Red
1430	43	Red	1610	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	TS	-40	85	°C	
Power Supply Voltage	VCC	-0.5	3.6	V	
Relative Humidity (non-condensation)	RH	5	95	%	
Damage Threshold	THd	0		dBm	

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Operating Case Temperature	TOP	0		70	°C	commercial
		-10		80		extended
		-40		85		Industrial
Power Supply Voltage	VCC	3.13	3.3	3.465	V	
Data Rate			2.5		Gb/s	
Control Input Voltage High		2		Vcc	V	
Control Input Voltage Low		0		0.8	V	
Link Distance (SMF)	D			120	km	9/125um

Electrical Characteristics

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter	Symbol	Min.	Typical	Max	Unit	Notes
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Power Consumption	P			0.95	W	commercial
				1.00		Industrial
Supply Current	Icc			280	mA	commercial
				300		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	Oh m	
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	Oh m	
Data output rise/fall time	Tr/Tf		100		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

The following optical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter	Symbol	Min.	Typical	Max	Unit	Notes
Transmitter						
Center Wavelength	λ_C	X-6.5	X	X+6.5	nm	1
Spectrum Bandwidth (RMS)	σ			1	nm	
Average Optical Power	PAVG	1		6	dBm	
Side Mode Suppression Ratio	SMSR	30			dB	

Extinction Ratio	ER	8.2			dB	
Transmitter OFF Output Power	Poff			-45	dBm	
Transmitter Eye Mask	Compliant with G.957(class 1 laser safety)					2
Receiver						
Center Wavelength	λC	127		1610	nm	
Sensitivity (Average Power)	Sen			-30	dBm	3
Input Saturation Power(overload)	Psa	-10			dBm	
LOS Assert	LO	-41			dBm	4
LOS De-assert	LO			-32	dBm	4
LOS Hysteresis	LO	0.5			dB	

Notes:

1.X: See ETU** Wavelength List.

2.Transmitter eye mask definition.

3.Measured with Light source 1270~1610nm, ER=8.2dB; BER $\leq$ 1E-12 @PRBS=2²³-1 NRZ

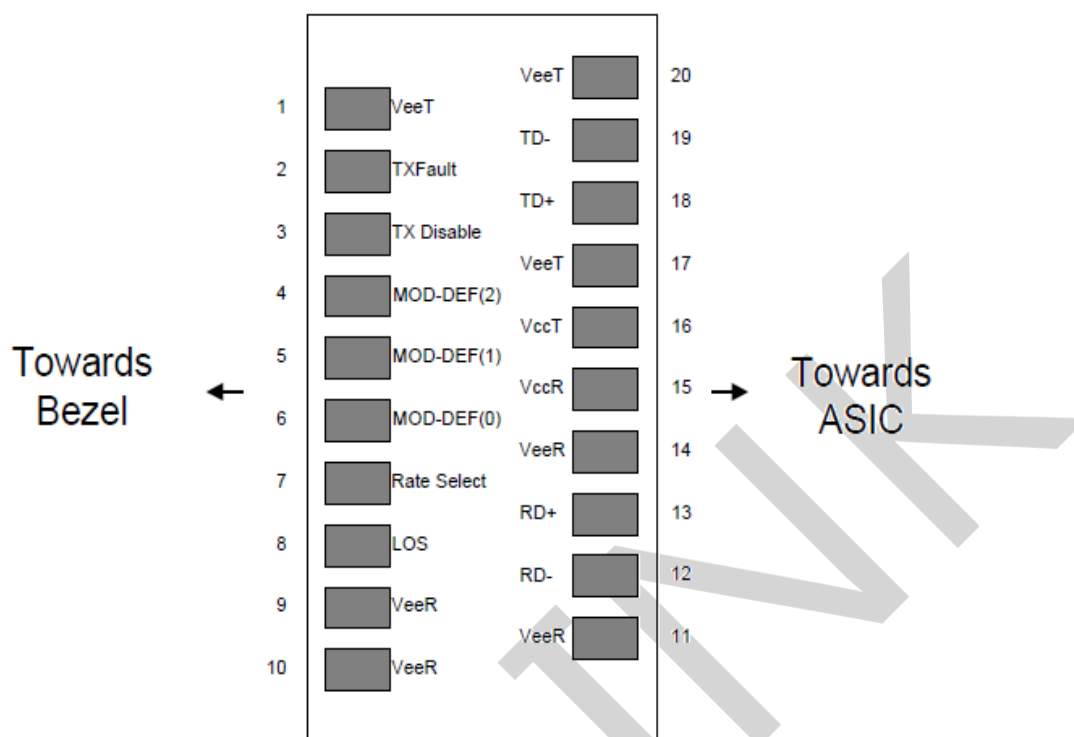
When LOS de-asserted, the RX data+/- output is High-level (fixed).

Digital Diagnostics

The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified. It is compliant to SFF-8472 Rev10.2 with internal calibration mode. For external calibration mode please contact our sales staff.

Parameter	Unit	Specification
Temperature Monitor absolute error	°C	± 3.0
Supply Voltage Monitor absolute error	%	± 10
I_bias Monitor absolute error	%	± 10
Received Power (Rx) Monitor absolute error	dB	± 3.0
Transmit Power (Tx) Monitor absolute error	dB	± 3.0

Pin Diagram



Pin Definitions

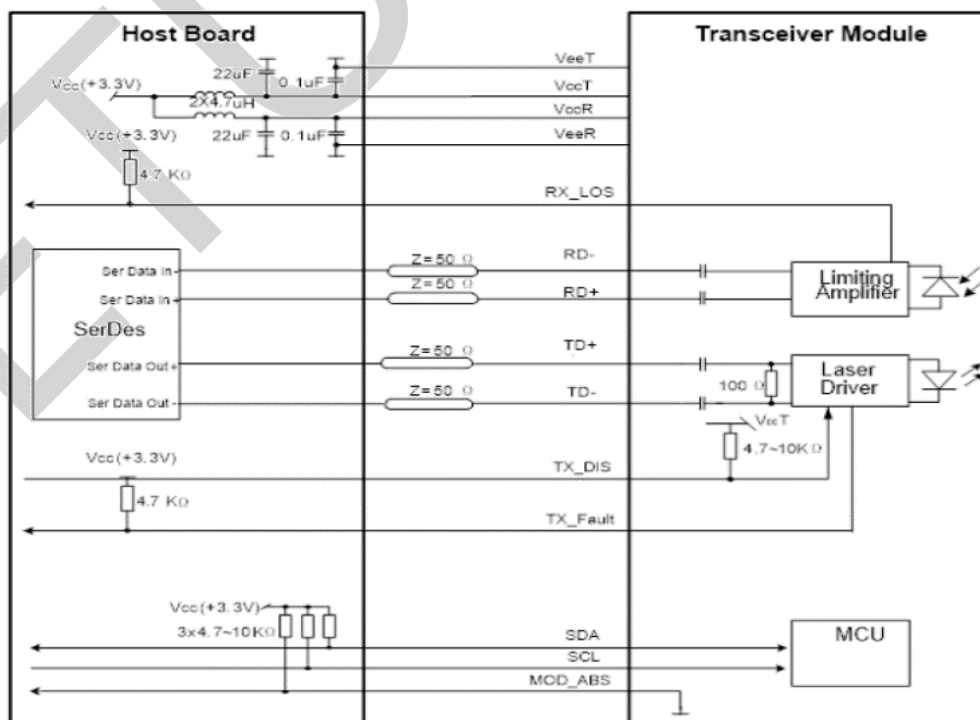
Pin	Symbol	Name/Description	Notes
1	VEET	Transmitter Ground (Common with Receiver Ground)	1
2	TXFAULT	Transmitter Fault.	
3	TXDIS	Transmitter Disable. Laser output disabled on high or open.	2
4	MOD_DE	Module Definition 2. Data line for Serial ID.	3
5	MOD_DE	Module Definition 1. Clock line for Serial ID.	3
6	MOD_DE	Module Definition 0. Grounded within the module.	3
7	Rate	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

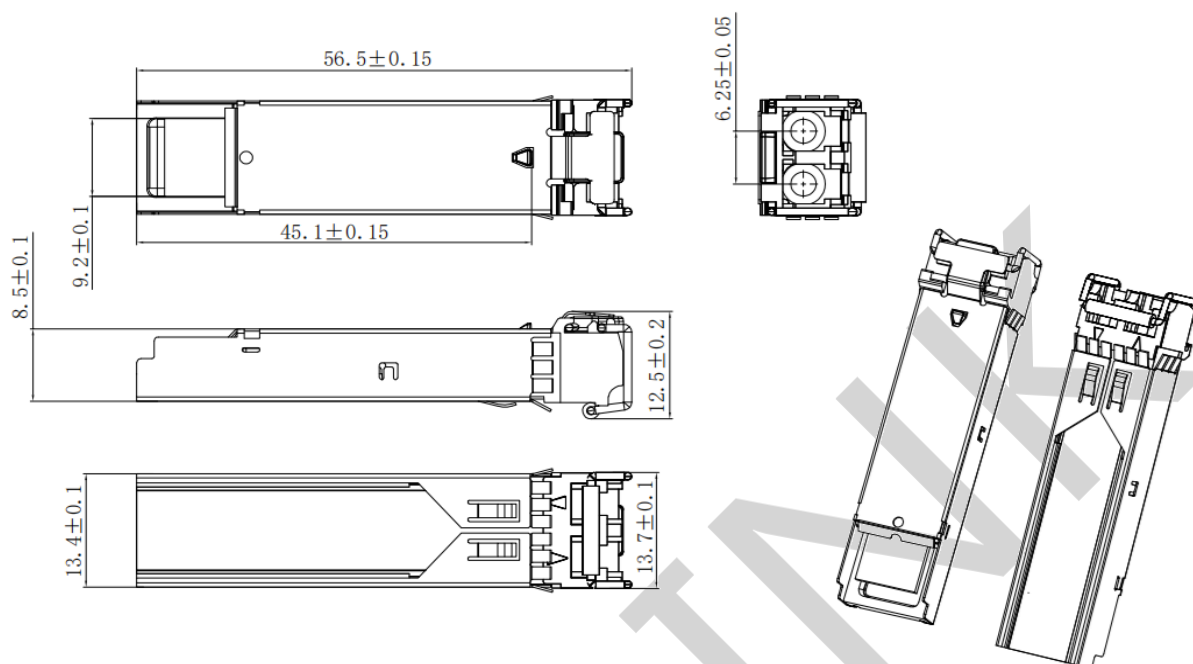
Notes:

- 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 Diagram



Revision History

Version No.	Date	Description
1.0	February 4, 2015	Preliminary datasheet
2.0	December 10, 2019	Product upgrades
3.0	Aug 12, 2024	Format change

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