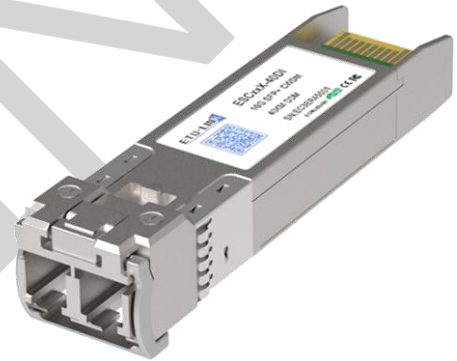


ESCxxX-40D(I)

10Gb/s SFP+ CWDM Transceiver, Single Mode, 40km Reach

PRODUCT FEATURES

- Supports up to 11.3Gbps bit rates
- Hot-Pluggable SFP Footprint and Single LC Connector
- CWDM EML laser from 1471nm to 1611nm, with step 20nm and PIN receiver
- Compatible with RoHS
- Single +3.3V power supply
- Real Time Digital Diagnostic Monitoring
- Operating case temperature:
- Temperature Range:
 - Commercial: 0°C ~70°C
 - Extended: -20°C ~85°C
 - Industrial: -40°C ~85°C
- Low power consumption :<1.5W
- Compliant with SFP-8431
- Compliant with SFP-8432
- Compliant with SFP-8472
- Compliant with IEEE802.3ae
- Complies with EU Directive 2015/863/EU



APPLICATIONS

- 10Gbps CWDM Optical systems
- 10GBASE-ER at 10.3125Gbps
- 10GBASE-EW at 9.953Gbps
- Other Optical links

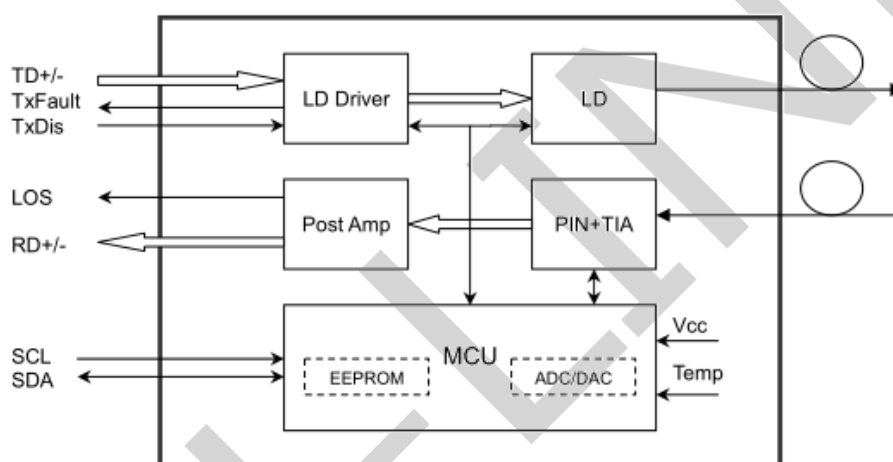
DESCRIPTIONS

The SFP+ transceivers are high performance, cost effective modules supporting data rate of 10Gbps 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.

Module Block Diagram



Ordering Information

Part No.	Data Rate(optical)	Laser	Fiber Type	Distance	Optical Interface	Temp	DDMI
ESCxxX-40D	10.3125Gbps	EML	SMF	40km	LC	0~70℃	Y
ESCxxX-40DE	10.3125Gbps	EML	SMF	40km	LC	-20~85℃	Y
ESCxxX-40DI	10.3125Gbps	EML	SMF	40km	LC	-40~85℃	Y

Wavelength Guide Pin Descriptions

Part No.	Channel	Wavelength(nm)		
		min	typical	max
ESC47X-40D	C47	1464.5	1471	1477.5
ESC49X-40D	C49	1484.5	1491	1497.5
ESC51X-40D	C51	1504.5	1511	1517.5

ESC53X-40D	C53	1524.5	1531	1537.5
ESC55X-40D	C55	1544.5	1551	1557.5
ESC57X-40D	C57	1564.5	1571	1577.5
ESC59X-40D	C59	1584.5	1591	1597.5
ESC61X-40D	C61	1604.5	1611	1617.5
ESC41X-40DI	C41	1403.5	1411	1418.5
ESC43X-40DI	C43	1423.5	1431	1438.5
ESC45X-40DI	C45	1443.5	1451	1458.5
ESC47X-40DI	C47	1463.5	1471	1478.5
ESC49X-40DI	C49	1483.5	1491	1498.5
ESC51X-40DI	C51	1503.5	1511	1518.5
ESC53X-40DI	C53	1523.5	1531	1538.5
ESC55X-40DI	C55	1543.5	1551	1558.5
ESC57X-40DI	C57	1563.5	1571	1578.5
ESC59X-40DI	C59	1583.5	1591	1598.5
ESC61X-40DI	C61	1603.5	1611	1618.5

Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Storage Temperature	T _{stg}	-40		+85	°C	
Relative Humidity - Storage	R _{HS}	5		95	%	
Relative Humidity - Operating	R _{HO}	5		85	%	
DC Supply Voltage	V _{CC}	0		3.6	V	

Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Case Operating Temperature	Top	0	-	70	°C	Commercial
		-40		85		Industrial
Power Supply Voltage	V _{CC}	3.13	3.3	3.47	V	
Transmission Distance	TD	-	-	40	km	Over SMF

Electrical Characteristics

High-Speed Signal: Compliant to CEI-11G-SR

Low-Speed Signal: Compliant to SFF-8419

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Supply Voltage	V _{CC}	3.135		3.465	V	
Supply Current	I _{CC}			450	mA	

Power Consumption		P			1.5	W	
Transmitter (Module Input)							
Differential Input Resistance		$R_{R_{din}}$	80	100	120	Ω	
Input Differential Voltage		$R_{V_{diff}}$	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_{R_d}	80	100	120	Ohm	
Output Differential Voltage		$T_{V_{diff}}$	360	-	770	mVpp	
Differential Termination Resistance Mismatch		$T_{R_{dm}}$	-	-	5	%	
Rx los	Normal Operation	V_{OL}	-0.3	-	0.4	V	
	Loss Signal	V_{OH}	2		V_{CCHOST}	V	

Optical and Characteristics

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Transmitter						
Centre Wavelength	λ_c	$\lambda_c-6.5$	λ_c	$\lambda_c+6.5$	nm	
Spectral Width (-20dB)	$\Delta\lambda$			1	nm	
Side-Mode Suppression Ratio	SMSR	30	-		dB	
Average Output Power	P_{out}	-1		4	dBm	1
Extinction Ratio	ER	8.2			dB	
RIN_{20OMA}	RIN			-128	dB/Hz	2
Receiver						
Centre Wavelength	λ_c	1260		1620	nm	
Receiver Sensitivity				-16	dBm	3
Receiver Overload		0.5			dBm	
LOS De-Assert	LOS_D			-17	dBm	
LOS Assert	LOS_A	-30			dBm	
LOS Hysteresis		0.5			dB	

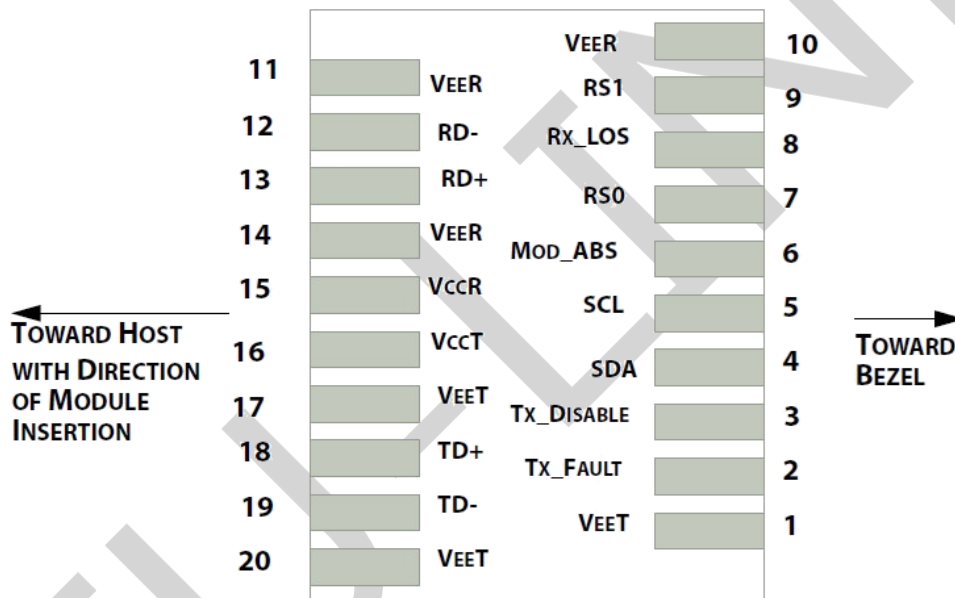
Notes:

- Output is coupled into a 9/125um SMF.
- 12dB reflection
- Measured with worst ER, BER less than 1E-12 and PRBS 2³¹-1 at 10.3125Gbps.

Digital Diagnostics

Parameter	Range	Unit	Accuracy	Calibration
Temperature	-40 to +85	°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 +4	dBm	±3dB	Internal
RX Power	-16 to -1	dBm	±3dB	Internal

Pin Diagram



Pin Definitions

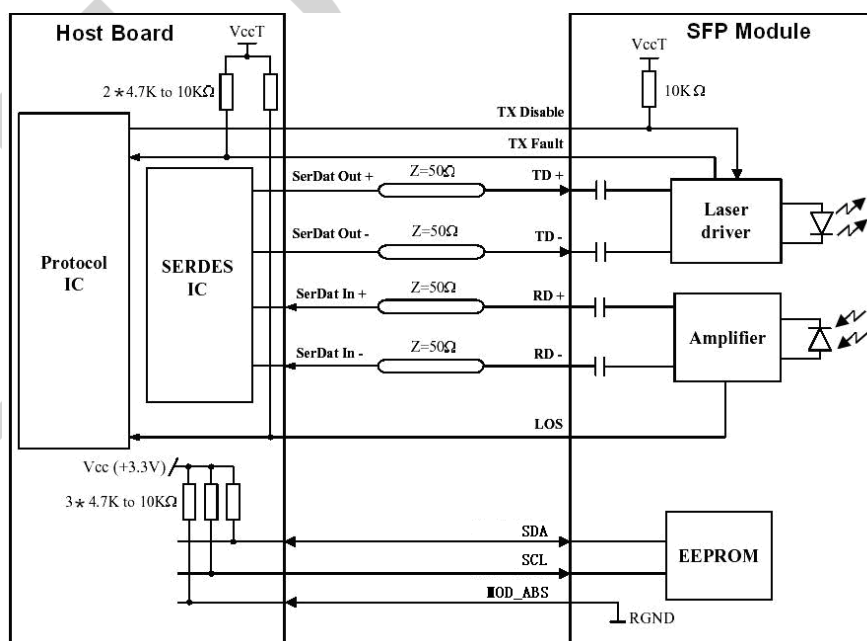
PIN #	Name	Function	Notes
1	VeeT	Module transmitter ground	1
2	Tx Fault	Module transmitter fault	2
3	Tx Disable	Transmitter Disable; Turns off transmitter laser output	3
4	SDL	2 wire serial interface data input/output (SDA)	4
5	SCL	2 wire serial interface clock input (SCL)	4
6	MOD-ABS	Module Absent, connect to VeeR or VeeT in the module	4
7	RS0	Rate select0, optionally control SFP+ receiver. When high, input data rate >4.5Gb/ s; when low, input data rate <=4.5Gb/s	5
8	LOS	Receiver Loss of Signal Indication	6
9	RS1	Rate select0, optionally control SFP+ transmitter. When high, input data rate >4.5Gb/s; when low, input data rate <=4.5Gb/s	1

10	VeeR	Module receiver ground	1
11	VeeR	Module receiver ground	1
12	RD-	Receiver inverted data output	
13	RD+	Receiver non-inverted data output	
14	VeeR	Module receiver ground	1
15	VccR	Module receiver 3.3V supply	
16	VccT	Module transmitter 3.3V supply	
17	VeeT	Module transmitter ground	1
18	TD+	Transmitter inverted data output	
19	TD-	Transmitter non-inverted data output	
20	VeeT	Module transmitter ground	1

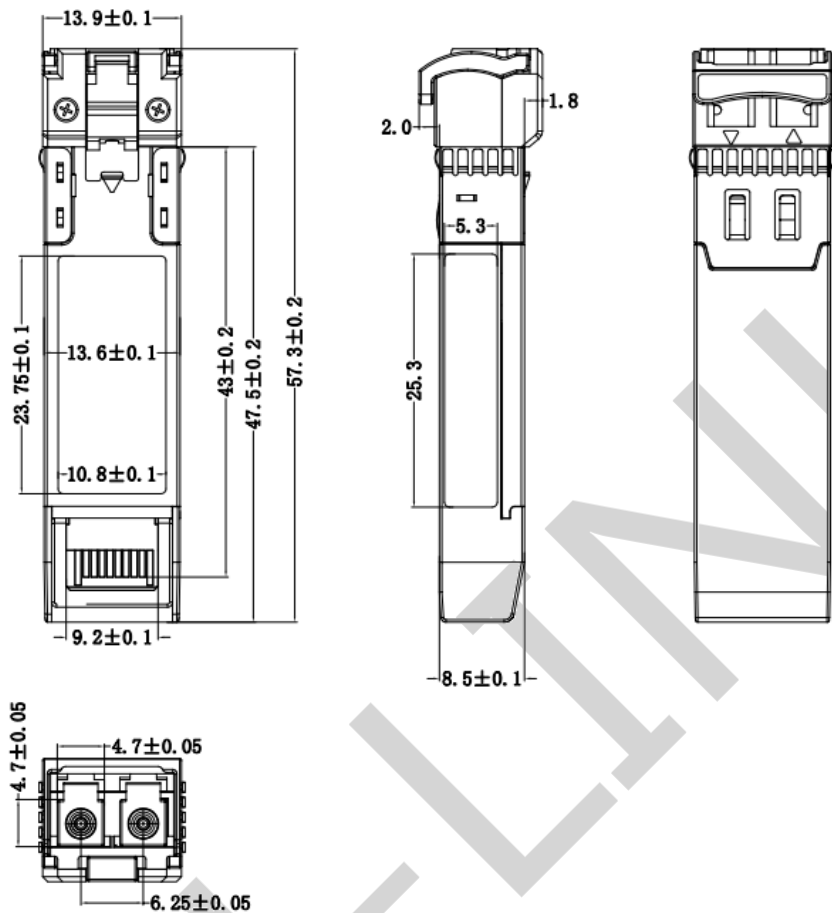
Notes:

1. Circuit ground is internally isolated from chassis ground
2. Tx FAULT is an open collector/drain output, which should be pulled up with a 4.7k – 10k Ohms resistor on the host board if intended for use. Pull up voltage should be between 2.0V to Vcc + 0.3V. A high output indicates a transmitter fault caused by either the TX bias current or the TX output power exceeding the preset alarm thresholds. A low output indicates normal operation. In the low state, the output is pulled to <0.8V.
3. Laser output disabled on Tx DIS >2.0V or open, enabled on Tx DIS <0.8V.
4. Should be pulled up with 4.7kΩ- 10kΩ host board to a voltage between 2.0V and 3.6V. MOD_ABS pulls line low to indicate module is plugged in.
5. Internally pulled down per SFF-8431 Rev 4.1.
6. LOS is open collector output. It should be pulled up with 4.7kΩ – 10kΩ 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, 2016	Preliminary datasheet
2.0	December 15, 2023	Product upgrades
2.0	Aug 26, 2024	Format change

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