SFP-10G-LR-DTBXD-C

Cisco® SFP-10G-LR-DTBXD Compatible and TAA 10G-BX DWDM 100GHz Multi-rate Multi-band SFP+ Transceiver (SMF, 20km, Primary, DOM)

Features:

- Hot-pluggable SFP+ footprint
- Supports 1.2 to 11.3 Gb/s
- Must be paired with a secondary, upstream transceiver
- Single 3.3V Power Supply
- Monolithic Tunable BOSA
- Limiting electrical interface receiver
- Single LC connector for Bi-directional
- 40 dual-band bidirectional Point-to- Point links in 100GHz ITU grids
- Built-in digital diagnostic functions
- Features auto-tuning technology
- Operating Temperature: 0C to 70C
- RoHS-6 compliant and Lead Free



Applications:

- 10x Gigabit Ethernet over DWDM
- 8x/10x Fibre Channel
- Access, Metro and Enterprise

Product Description

This Cisco® SFP-10G-LR-DTBXD compatible SFP+ transceiver provides 10GBase-DWDM throughput up to 20km over single-mode fiber (SMF) using a tunable wavelength via an LC connector. It is built to MSA standards and is uniquely serialized and data-traffic and application tested to ensure that they will integrate into your network seamlessly. Digital optical monitoring (DOM) support is also present to allow access to real-time operating parameters. This transceiver is Trade Agreements Act (TAA) compliant. We stand behind the quality of our products and proudly offer a limited lifetime warranty.

ProLabs' transceivers are RoHS compliant and lead-free.

TAA refers to the Trade Agreements Act (19 U.S.C. & 2501-2581), which is intended to foster fair and open international trade. TAA requires that the U.S. Government may acquire only "U.S.-made or designated country end products.")

TAA COMPLIANT

Rev. 012026

Regulatory Compliance

- ESD to the Electrical PINs: compatible with MIL-STD-883E Method 3015.4
- ESD to the LC Receptacle: compatible with IEC 61000-4-3
- EMI/EMC compatible with FCC Part 15 Subpart B Rules, EN55022:2010
- Laser Eye Safety compatible with FDA 21CFR, EN60950-1& EN (IEC) 60825-1,2
- RoHS compliant with EU RoHS 2.0 directive 2015/863/EU

Wavelength Guide (100GHz ITU-T Channel)

No	ITU Grids (GHz)	Downstream (GHz)	Upstream (GHz)	No	ITU Grids (GHz)	Downstream (GHz)	Upstream (GHz)
1	192,100	192,080	192,120	**21**	194,100	194,080	194,120
2	192,200	192,180	192,220	**22**	194,200	194,180	194,220
3	192,300	192,280	192,320	**23**	194,300	194,280	194,320
4	192,400	192,380	192,420	**24**	194,400	194,380	194,420
5	192,500	192,480	192,520	**25**	194,500	194,480	194,520
6	192,600	192,580	192,620	**26**	194,600	194,580	194,620
7	192,700	192,680	192,720	**27**	194,700	194,680	194,720
8	192,800	192,780	192,820	**28**	194,800	194,780	194,820
9	192,900	192,880	192,920	**29**	194,900	194,880	194,920
10	193,000	192,980	193,020	**30**	195,000	194,980	195,020
11	193,100	193,080	193,120	**31**	195,100	195,080	195,120
12	193,200	193,180	193,220	**32**	195,200	195,180	195,220
13	193,300	193,280	193,320	**33**	195,300	195,280	195,320
14	193,400	193,380	193,420	**34**	195,400	195,380	195,420
15	193,500	193,480	193,520	**35**	195,500	195,480	195,520
16	193,600	193,580	193,620	**36**	195,600	195,580	195,620
17	193,700	193,680	193,720	**37**	195,700	195,680	195,720
18	193,800	193,780	193,820	**38**	195,800	195,780	195,820
19	193,900	193,880	193,920	**39**	195,900	195,880	195,920
20	194,000	193,980	194,020	**40**	196,000	195,980	196,020

Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Maximum Supply Voltage	Vcc	-0.5		4.0	V	
Storage Temperature	TS	-40		85	°C	
Operating Case Temperature	Tc	0		70	°C	
Relative Humidity	RH	0		85	%	1
Receiver Optical Damage Threshold	RxDamage	3			dBm	
Bit Rate	BR	1.2		11.3125	Gb/s	2
Max. Supported Link Length	LMAX			20	km	3

Notes:

1. Non-condensing
2. The product can support data rates up to 11.3 Gb/s, but we only test at 10.3 Gb/s with a $2^{31} - 1$ PRBS pattern at the BER defined in Timing Parameters.
3. Over G.652 single mode fiber.

Electrical Characteristics (over Top)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Supply Voltage	V_{CC}	3.14		3.46		
Supply Current	Icc			796	mA	1
Module total power dissipation	P			2.5	W	2
Transmitter						
Input differential impedance	R_{in}	80	100	120	Ω	
Differential data input swing	Vin,pp	200		850	mV	3
Transmit Disable Voltage	V_D	V_{CC}-0.8		V_{CC}	V	
Transmit Enable Voltage	V_{EN}	V_{EE}		V_{EE}+ 0.8	V	
Receiver						
Output differential impedance	R_{out}	80	100	120	Ω	
Differential data output swing	$V_{out,pp}$	300		850	mV	4
Output rise time and fall time	Tr, Tf	28			ps	4, 5
LOS asserted	V_{LOS_A}	V_{CC}-0.8		V_{CC}	V	
LOS de-asserted	V_{LOS_D}	V_{EE}		V_{EE}+0.8	V	
Power Supply Noise Tolerance	V_{ccT}/V_{ccR}	Per SFF-8431 Rev 4.1			mV_{pp}	

Notes:

1. Compliant with the SFP+ Module Power Supply Requirements defined in [1], Tab. 8.
2. Maximum total power value is specified across the full operating temperature and voltage range.
3. Connected directly to TX data input pins.
4. Into 100Ω differential termination.
5. 20 – 80%. Measured with Module Compliance Test Board and OMA test pattern. Use of four 1's and four 0's sequence in the PRBS 9 is an acceptable alternative. SFF-8431 Rev 4.1.

Optical Characteristics (over T_{OP}, VCC = 3.14 to 3.46 Volts)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter							
Average Launch Power		P_{AVE}	0.5			dBm	
Nominal Optical Central Wavelength		λ_c	1529.55		1565.50	nm	2
Nominal Optical Central Frequency		f_c	192.1		196.0	THz	2
Downstream channels (west to east)		f_{c_east}	192.08		195.98	THz	2,3
Wavelength tuning channel to channel		T_{TUNE}		1		s	7
Optical Return Loss Tolerance		RL	24			dB	
Side-Mode Suppression Ratio		SMSR	30			dB	
Optical Extinction Ratio		ER	9.0	9.5		dB	
Ave. Launch power when Tx is OFF		P_{OFF}			-30	dBm	
Tx Jitter		Tx_{j1}	Per 802.3ae requirements				
Relative Intensity Noise		RIN			-128	dB/Hz	
Center Wavelength		λc_EOL	z-5	z	z+5	GHz	
Receiver at 360ps/nm over 20km							
Bit rate	**BER**						
9.83 Gb/s	**<1E-12**	R_{SENS1}			-18.5	dBm	4,5
10.3 Gb/s	**<1E-12**	R_{SENS2}			-18.5	dBm	4,5
Overload (Average Power)		P_{AVE}			-7	dBm	
Optical Center Wavelength		λC	1527		1569	nm	6
LOS De-Assert		LOS_D			-19.5	dBm	
LOS Assert		LOS_A	-34		-20.0	dBm	
LOS Hysteresis		LOS_H	0.5			dB	
Receiver Reflectance		R_{rx}			-27	dB	

Notes:

1. The wavelength and output power are expected to be detected by external wavelength and/or power monitor device during power leveling, and feedback, if needed, is expected to be provided through communication channel.
2. As per ITU-T 694.1, 40 channel 100GHz spacing.
3. The East and West channels are located off-grid to 100GHz ITU grids by the typical value specified here.
4. Measured with ER=9.5dB; BER<10^{-12}; $2^{31} - 1$ PRBS. Including ~0.5dB penalty for crosstalk of Tx to Rx and penalty from Out of Band channel T^2DOC.
5. For 10GE application, -18.5 dBm is equivalent to an OMA of -16.5 dBm at 9.5dB ER.
6. Measured at 1527-1569 nm with worst ER; PRBS31.
7. Tuning time required to actively change wavelength of the local transceiver (while not using auto-tuning).

Timing Parameters

Parameter	Symbol	Min.	Max.	Unit	Notes
Time to initialize cooled module	t_start_up_cooled		90	s	1

Notes:

1. Excludes cold start time, which can take between 5-12 minutes.

Pin Descriptions

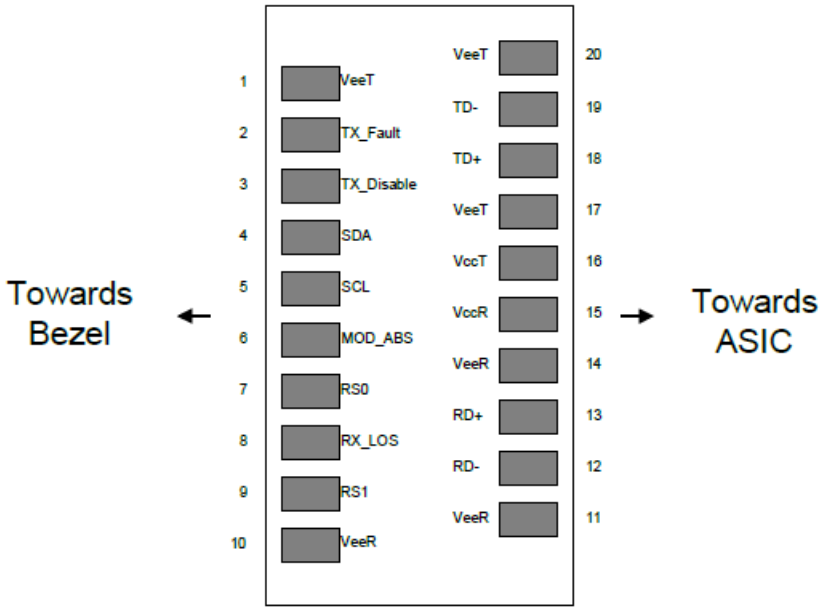
Pin	Symbol	Name/Descriptions	Ref.
1	V_{EET}	Transmitter Ground	1
2	T_{FAULT}	Transmitter Fault	2
3	T_{DIS}	Transmitter Disable. Laser output disabled on high or open.	3
4	SDA	2-wire Serial Interface Data Line	2
5	SCL	2-wire Serial Interface Clock Line	2
6	MOD_ABS	Module Absent. Grounded within the module	2
7	NA	Not Used	
8	RX_LOS	Loss of Signal indication. Logic 0 indicates normal operation.	4
9	NA	No Used	
10	V_{EER}	Receiver Ground	1
11	V_{EER}	Receiver Ground	1
12	RD-	Receiver Inverted DATA out. AC Coupled.	
13	RD+	Receiver Non-inverted DATA out. AC Coupled.	
14	V_{EER}	Receiver Ground	1
15	V_{CCR}	Receiver Power Supply	5
16	V_{CCT}	Transmitter Power Supply	5
17	V_{EET}	Transmitter Ground	1
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	
19	TD-	Transmitter Inverted DATA in. AC Coupled.	
20	V_{EET}	Transmitter Ground	1

Notes:

1. Circuit ground is internally isolated from chassis ground.
2. T_{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 T_{DIS} >2.0V or open, enabled on T_{DIS} <0.8V.
4. 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.
5. Internally connected



Pin-out of connector Block on Host board

Digital Diagnostic Specifications

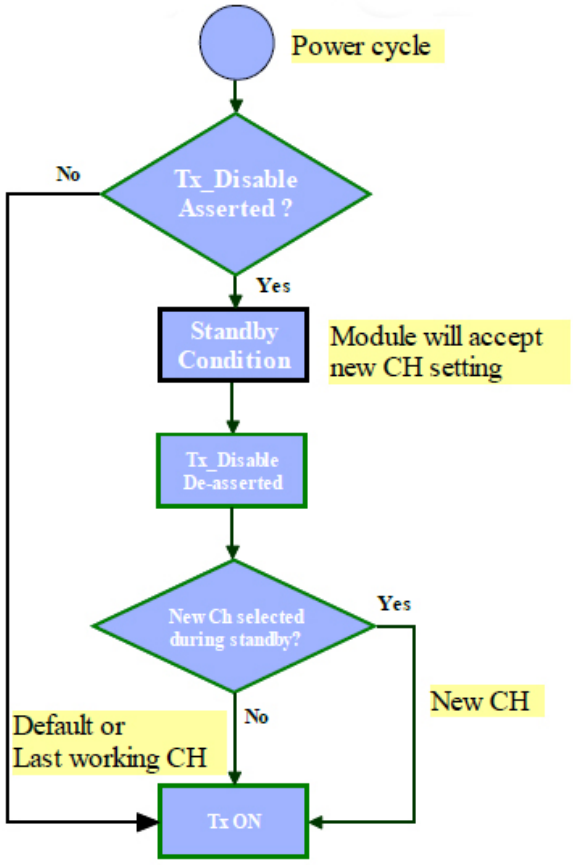
Parameter	Symbol	Min.	Max.	Unit	Accuracy	Notes
Transceiver temperature	ΔDDTemp	-20	+85	ºC	±5ºC	1
Transceiver supply voltage	ΔDDVoltage	2.8	4.0	V	±3%	
Transmitter bias current	ΔDDBias	0	127	mA	±10%	2
Transmitter output power	ΔDDTx-Power	-1	+5	dBm	±2dB	
Receiver average optical input power	ΔDDRx-Power	-22	-7	dBm	±2dB	

Notes:

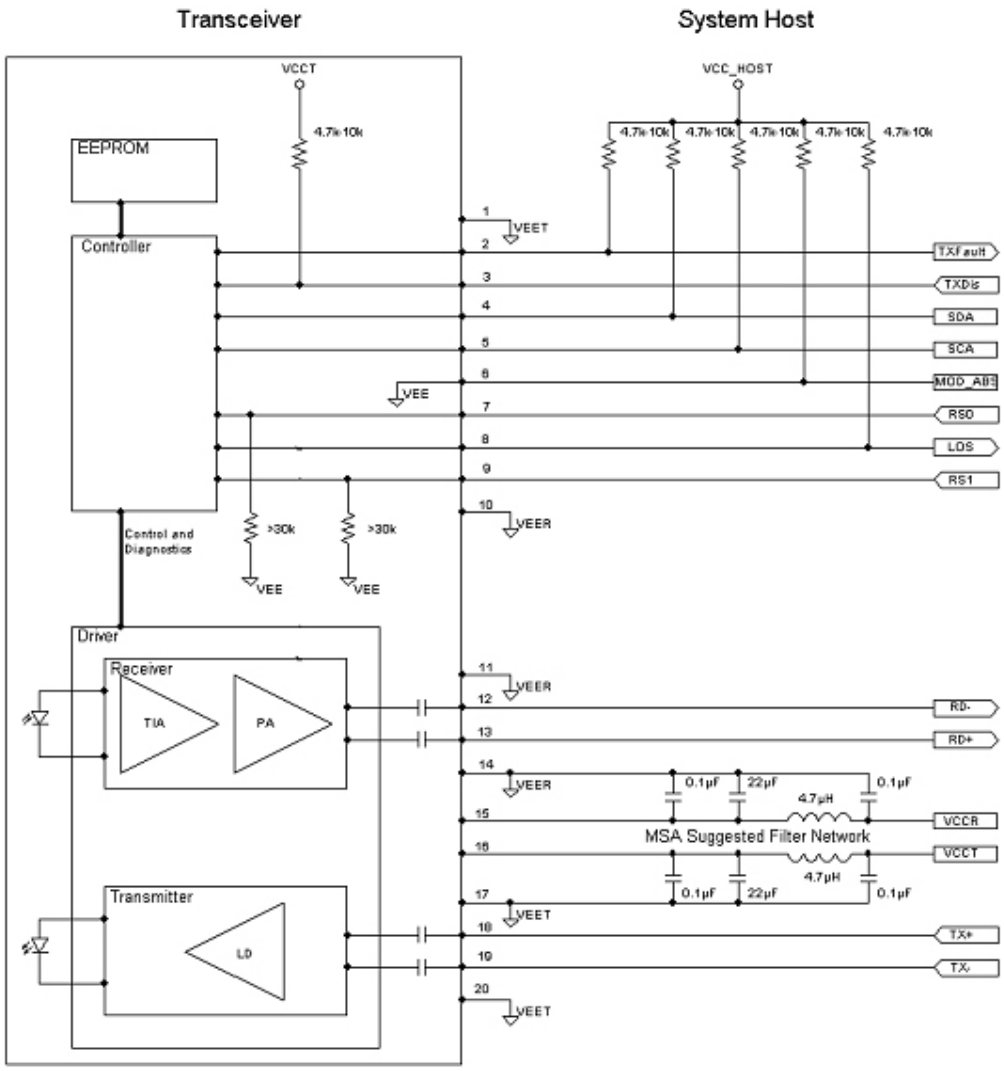
1. Typical value measured at internally measured location.
2. The accuracy of the Tx bias current is 10% of the actual current from the laser driver to the laser

Start-Up Sequence

The modules adhere to MSA SFF-8690 for wavelength / channel selection of these tunable modules. The module behavior is described in the flowchart below:



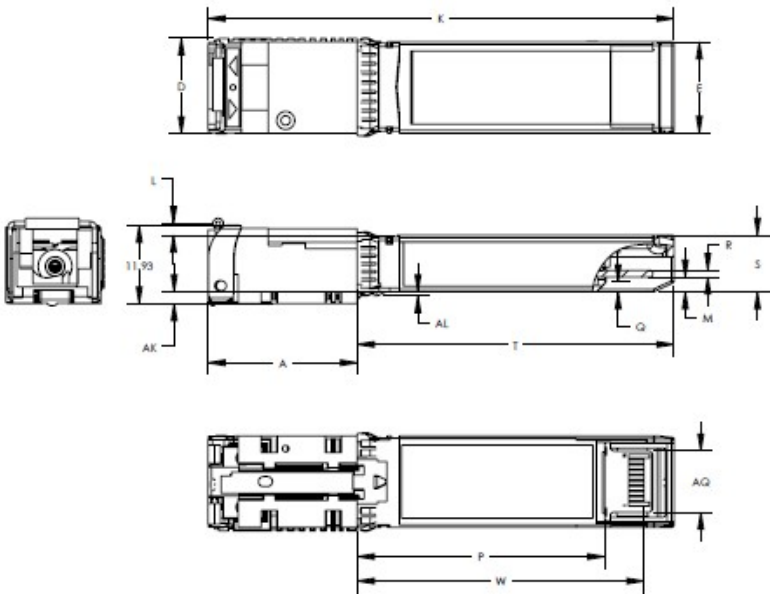
Host-Module Interface Diagram



Mechanical Specifications

SFP+ transceivers are compatible with the SFF-8432 specification for improved pluggable form factor, and shown here for reference purposes only. Bail color is Blue.

ITEM	DIM(MM)	ToL(MM)
A	19.00	
D	13.90	
E	13.70	
K	66.50	
L	1.63	
M	2.25	
P	37.10	
Q	1.50	
R	1.00	
S	8.50	
T	47.50	
W	43.00	
AL	0.60	
AK	1.80	
AQ	9.20	



About ProLabs

Our extensive experience comes as standard. For over 20 years ProLabs has delivered optical connectivity solutions that give our customers freedom and choice through our ability to provide seamless interoperability. At the heart of our company is the ability to provide state-of-the-art optical transport and connectivity solutions that are compatible with more than 100 optical switching and transport platforms.

A Complete Portfolio of Network Solutions

ProLabs is focused on innovations in optical transport and connectivity. The combination of our knowledge of optics and networking equipment enables ProLabs to be your single source for optical transport and connectivity solutions from 100Mb to 1.6T while providing innovative solutions that increase network efficiency. We provide the optical connectivity expertise that is compatible with and enhances your switching and transport equipment.

The Trusted Partner

Customer service is our number one value. ProLabs has invested in people, labs and manufacturing capacity to ensure compatible products, and immediate answers to your questions. With Engineering and Manufacturing offices in the U.K. and U.S. augmented by field offices throughout the U.S., U.K. and Asia, ProLabs is able to be our customers best advocate 24 hours a day.



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