

10Gbps 40km DWDM Industrial Temp, 8 Channel, C-Band Narrow Tunable SFP+



Key Features

- 5-part codes to cover the complete C-band (100GHz spacing) enables simplified sparing and configuration
- Up to 40km link length single mode fibre point-to-point and multi-point passive networks
- Supports data rates between 1Gbps and 11.3Gbps
- Operating temperature range -40°C to 85°C
- Dual LC connector, hot pluggable with SFP+ footprint
- Limiting receiver electrical interface
- Power dissipation <2.0W
- Compliant with Electrical SFP+ MSA SFF-8418/8419
- Compliant with Interface SFP+ MSA SFF-8472/8690
- Compliant with Mechanical SFP+ MSA SFF-8432
- SFP+ Multi-Source Agreement compliant (SFF-8083, rev. 1.7)
- Duplex LC connector, hot pluggable with SFP+ footprint
- Support for digital diagnostics and monitoring
- Integrated wavelength locking and power control
- Maximum Power dissipation less than 2W
- RoHS 6/6 compliant

Overview

Luxglo 10Gbps Narrow Tunable SFP+ optical transceiver module is designed to operate at transmission rates from 1Gbps to 11.3Gbps, compatible with multiple network applications and transmission formats: CPRI, OTN, Fibre Channel, etc. Hot pluggable, and with narrow band tunability, significantly reduces sparing and configuring costs in optical networks. The module is optimized for Local Area Networks (LAN), Mobile Fronthaul and 10G Ethernet (10GbE), over single-mode fibre (SMF) optical links, P2P and passive networks.

On the transmit side, the serial data path from the host enters the module through the electrical connector and enters the modulator driver. The modulator driver accurately biases and efficiently modulates Optical System-on-Chip which contains the tunable 1550nm cooled laser and Mach-Zehnder Interferometer (MZI) modulator and transmits the optical signal through an industry standard LC connector. Wavelength

control to 100GHz ITU grid and optical power monitoring over life is also integrated within Optical System-on-Chip and packaging technology.

On the receive path, DC balanced serial NRZ data is efficiently converted into the electrical domain through the Receiver Optical Sub-Assembly (ROSA) which contains an Avalanche Photo Diode Receiver (APD) and Trans-Impedance Linear Amplifier (TIA) with Limiting output to the host.

Optical System-on-Chip and novel packaging technology ensures reliable operation over life.

Typical Applications

- Mobile Fronthaul
- CPRI 2 - 8 and eCPRI (10G)
- 10G DWDM Point-to-Point links
- Multi-point networks
- Local area networks (LAN)
- 10GBase-ER Ethernet applications
- 1G FC to 10G FC
- 10G OTN
- Storage area networks (SAN)

Compliance

- SFF-8083, rev 1.7
- SFF-8418, rev 1.4
- SFF 8419, rev 1.3
- SFF-8432, rev 5.1
- SFF-8472, rev 12.2
- SFF-8690, rev 1.4
- Telcordia GR-468-CORE
- Telcordia GR-63-CORE, NEBS
- IEC 60825-1 Ed 2 Class 1
- FDA 21 CFR Ch1 Class 1
- RoHS 6/6 Lead Free
- SFF 8419, rev 1.3
- SFF-8418, rev 1.4
- SFF-8432, rev 5.1
- SFF-8472, rev 12.2
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Module Wavelength Assignments and Part Codes

The center wavelengths of bands 1 to 5 are aligned to DWDM wavelength grid spaced 0.8nm (100 GHz) apart. Individual channels within each module is pre-calibrated.

C	Part Code	Wavelength (nm)	Frequency (THz)	Spacing (GHz)	C-Band	No. of Channels
1	TSFP+C2027-I	1561.42 to 1555.75	192.00 to 192.70	100	C20 - C27	8
2	TSFP+C2835-I	1554.94 to 1549.32	192.80 to 193.50	100	C28 - C35	8
3	TSFP+C3643-I	1548.51 to 1542.94	193.60 to 194.30	100	C36 - C43	8
4	TSFP+C4451-I	1542.14 to 1536.61	194.40 to 195.10	100	C44 - C51	8
5	TSFP+C5259-I	1535.82 to 1530.33	195.20 to 195.90	100	C52 - C59	8

General Specifications

- Transmit path:
 - Integrated tunable Laser with optical amplifier (SOA)
 - Mach-Zehnder Modulator (MZM)
 - Wavelength locker
- Receive path:
 - 10Gbps APD photodiode and TIA amplifier
 - Integral CDR, with bypass functionality
- Operating case temperature:
 - Normal operating conditions: -40C to +85C
- Electro-optical connections:
 - Single +3.3V supply
 - Single duplex optical LC connector
- Compliance with:
 - FCC 47 CFR Part 15, Class B & EN 55022 Class B, EMC and Immunity
 - EN61000-4-3, Immunity against Radio Frequency Electromagnetic Field
 - EN61000-4-2, Immunity against Electrostatic Discharge (ESD)

Absolute Maximum Ratings

Parameter	Min	Max	Unit	Notes
Storage temp	-40	+85	°C	
Relative humidity	5	95	%	Non-condensing
Electrical static discharge (HBM Model)	500	1000	V	ESD, per JEDEC JESD22-A114-B
Absolute maximum power supply voltage	0	3.6	V	
Receiver Optical Damage Threshold		+3.5	dBm	This must not be exceeded

Operating Conditions

Parameter	Min	Typ	Max	Unit	Notes
Nominal operating temp (case)	-40		+85	°C	
Nominal relative humidity	5		85	%	Non-condensing
Power supply voltage	3.14	3.3	3.46	V	

Power supply current	0	650	mA
Total power dissipation	1.5	2.0	W

Optical Characteristics

Transmit Characteristics

Parameter	Min	Typ	Max	Unit
Signalling rate	1.0		11.3	Gbps
Optical output power	-1		+3	dBm
Fiber dispersion (SMF28 NDSF ITU-T G.652)	0		+700	ps/nm
Extinction ratio (10.709Gbps NRZ, filtered)	9.0	10.0		dB
Optical eye shape & mask	GR-253 & ITU-T G.691/G.959.1 and IEEE 802.3 clause 52			
Eye mask margin	10			%
Spectral width -20dB (10.709Gbps NRZ)			0.3	nm
Optical Frequency Tuning Range (5 bands)	192.00 (1561.42)		195.90 (1530.33)	THz(nm)
SMSR	30	35		dB
Optical frequency minimum tuning grid	100			GHz
Optical centre wavelength λ_c	As per ITU-T 694.1			nm
Optical frequency accuracy (deviation from centre) EOL	-2.5		+2.5	GHz
Time to initialize cooled operation		10	90	Sec
Tuning speed (channel to channel)			10	Sec

Receive Characteristics

Parameter	Min	Max	Unit
Receiver wavelength range	191.00 (1569.59)	197.00 (1521.79)	THz(nm)
Receiver power	-27	-7	dBm
Receiver optical reflectance		-27	dB
LOS assert	-35	-30	dBm
LOS assert/de-assert hysteresis	0.5	2.0	dB

Data Rate (Gbps)	BER	Maximum Rx Sensitivity (dBm)	
		0km (0ps/nm)	40km (700ps/nm)
1 - 10.7	$1 \cdot 10^{-12}$	-23	-19
11.1 - 11.3	$1 \cdot 10^{-4}$	-27	-23

OSNR Characteristics

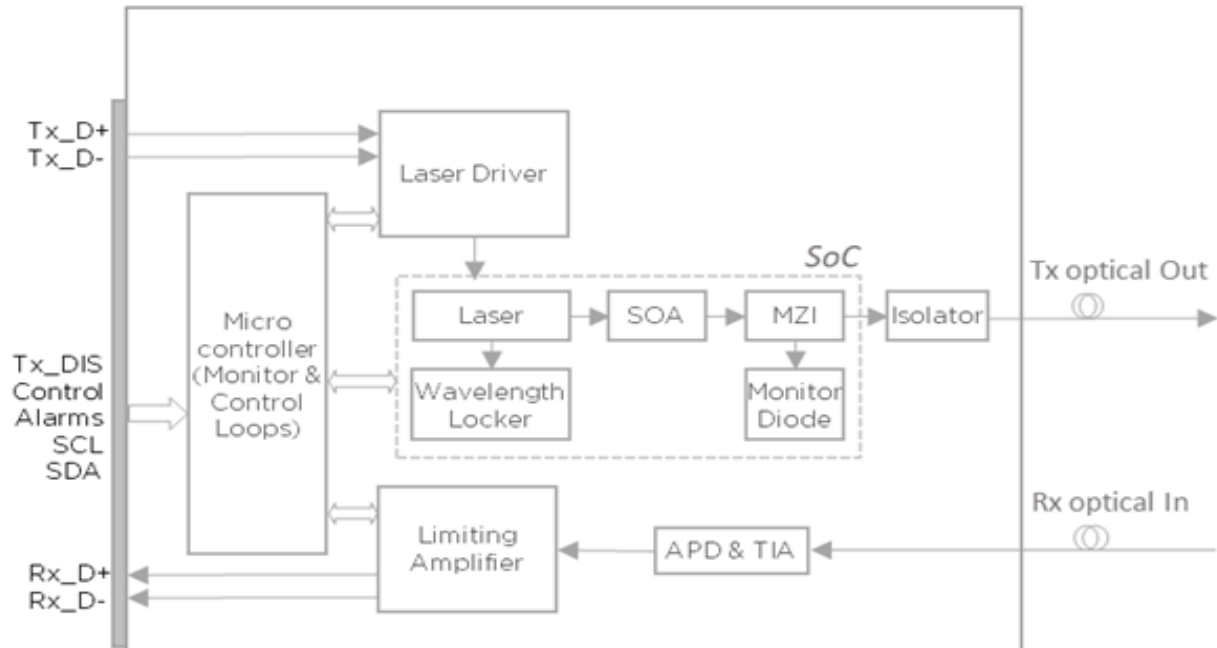
Data Rate (Gbps)	BER	Dispersion (ps/nm)	Rx Power Range (dBm)		OSNR (dB)
			Min	Max	
1 - 10.7	$1 \cdot 10^{-12}$	0	-18	-7	25
1 - 10.7	$1 \cdot 10^{-12}$	0 to 700 ps/nm	-18	-7	28
11.1- 11.3	$1 \cdot 10^{-4}$	0	-18	-7	18
11.1- 11.3	$1 \cdot 10^{-4}$	0 to 700 ps/nm	-18	-7	21

1 Measured with minimum ER; PRBS 231-1; over specified wavelength range; OSNR >30 dB; with external clock and data recovery (CDR) board
 2 Measured with fixed RxDTV; 0.55nm 3dB filter BW; OSNR resolution 0.2 nm; PRBS 231-1; with external clock and data recovery (CDR) board

Module Management Interface

Luxglo Narrow Tunable SFP+ optical transceiver module supports the digital diagnostic interface by using a two-wire serial bus address to provide diagnostic information about the operating condition. All calibration and warning/alarm threshold data is written to the module during device manufacture.

Block Diagram



Luxglo narrow tunable SFP+ optical transceiver

Wavelength Auto-Tuning types

- Paired Tuning: Head-End module has the ability to change available channel of the Tail-End module.
- Blind Tuning: Tail-End module performs auto-tuning to match wavelength of the Head-End module and establishes link.
- Autonomous Tuning: Both Head

Remote Diagnostics

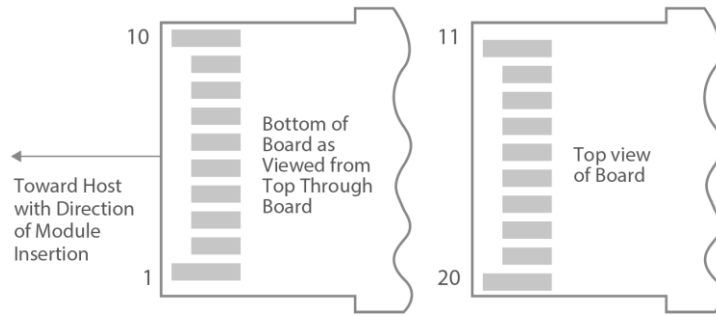
- Read/Write access to all registers (A0h/A2h) of the remote module as equivalently to the way to access local register.
- Monitoring of remote module information and live Diagnostics

Regulatory & Compliance Standards

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Single-Mode Optical Connectors and Jumper Assemblies
- IEEE 802.3x: 10-Gigabit Ethernet & Ethernet Traffic Interfaces
- ITU-T G.709: Interfaces for the OTN
- ITU-T G.694.1: DWDM Frequency Grid
- Laser Safety Classification, Class 1 (21CFR1040 and IEC 60825)
- Tunable SFP+ Module Pin Functions & Definitions

Pin No.	Logic	Symbol	Power Sequence Order	Description	Note
1		VeeT	1	Module Transmitter Ground	1
2	LVTTL-O	TX_Fault	3	Module Transmitter Fault	2
3	LVTTL-I	TX_Disable	3	Transmitter Disable. Turns off laser output	3
4	LVTTL-I/O	SDA	3	2-wire Serial interface Data line	
5	LVTTL-I/O	SCL	3	2-wire Serial Interface Clock	
6		Mod_ABS	3	Module absent, connect to VeeT or VeeR in the module	
7	LVTTL-I	RS0	3	Unused	
8	LVTTL-O	Rx_LOS	3	Receiver Loss of Signal Indication	2
9	LVTTL-I	RS1	3	Unused	
10		VeeR	1	Module Receiver Ground	1
11		VeeR	1	Module Receiver Ground	1
12	CML-O	RD-	3	Receiver Inverted Data Output	
13	CML-O	RD+	3	Receiver Non-Inverted Data Output	
14		VeeR	1	Module Receiver Ground	1
15		VccR	2	Module Receiver 3.3V Supply	
16		VccT	2	Module Transmitter 3.3V Supply	
17		VeeT	1	Module Transmitter Ground	1
18	CML-I	TD+	3	Transmitter Non-Inverted Data Input	
19	CML-I	TD-	3	Transmitter Inverted Data Input	
20		VeeT	1	Module Transmitter Ground	1

1. The module signal ground pins, VeeR and VeeT, are isolated from the module chassis ground.
2. This pin is an open collector/drain output pin and shall be pulled up with 4.7-10 kohms to power supply voltage between 3.3V and 3.5V on the host board.
3. TX_Disable is an input contact with a 4.7-10 kohm pull-up to VccT inside the module.

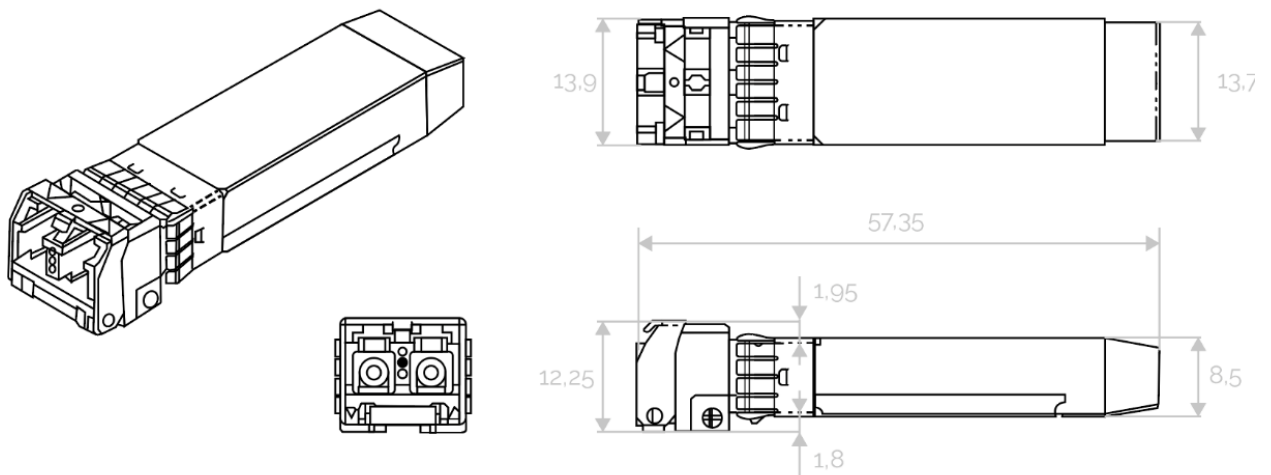


Tunable SFP+ Module Mechanical Outline

Mechanical outline compliant with the SFP+ Multi-Source Agreement compliant (SFF-8432, rev. 5.1)

Mechanical Dimensions

W 13.9mm x L 56.5mm x H 11.85mm. SFP+ MSA compliant.



Laser Safety

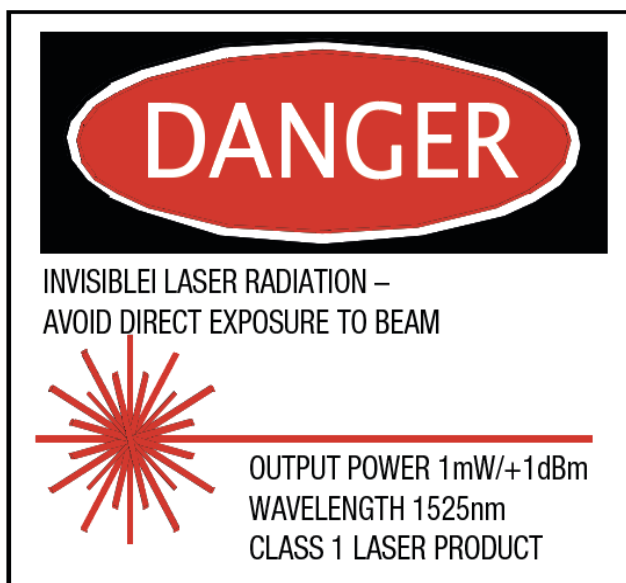
This product has been evaluated and certified against the following FDA CFR and EU IEC laser safety standards:

- IEC 60825-1 Ed 2 Class 1
- FDA 21 CFR Ch1 Class 1

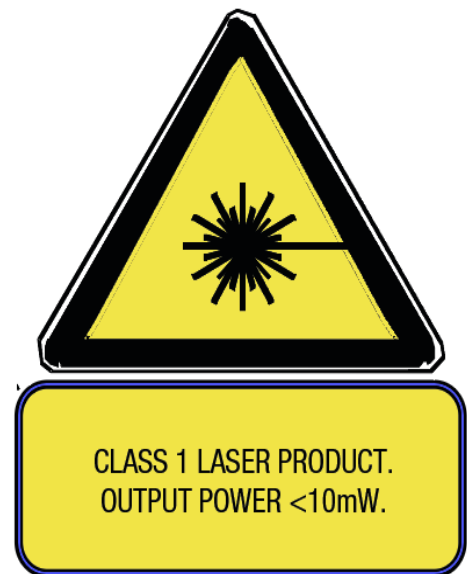
Caution: Use of controls or adjustment or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Operate the Luxglo module only with the application of voltages and currents specified in the product data sheet and methods of operation described in this document.

The Luxglo module contains no user serviceable parts.



THIS PRODUCT COMPLIES WITH 21CFR 1040.10



REFERENCE IEC 60825-1 Edition 2 (2014)

For More Information:

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