

## GIGALIGHT 100G CFP DCO Optical Transponder GCF-S101-xx-xTCA

### Features

- ◆ Operating optical data rate up to 128Gbps
- ◆ Transmission distance up to 2000km
- ◆ CD tolerance max. 40000ps/nm
- ◆ DGD tolerance 50ps
- ◆ Low latency HD-FEC/SD-FEC
- ◆ Full C-Band 50GHz ITU-T Grid
- ◆ Built in Client and line OTN Processing
- ◆ Hot pluggable electrical interface
- ◆ Typical power dissipation 21/28W
- ◆ Operating case temperature 0°C to +70°C
- ◆ Single 3.3V power supply
- ◆ 2\*LC Fiber connections
- ◆ CFP MSA compliant
- ◆ IEEE 802.3ba MAC compliant
- ◆ OTL4.10 and CAUI-10 compatible
- ◆ PRBS generation and detection for line and host interfaces
- ◆ RoHS compliant(Lead Free)
- ◆ ZR、MR、LH Application
- ◆ Single ITLA



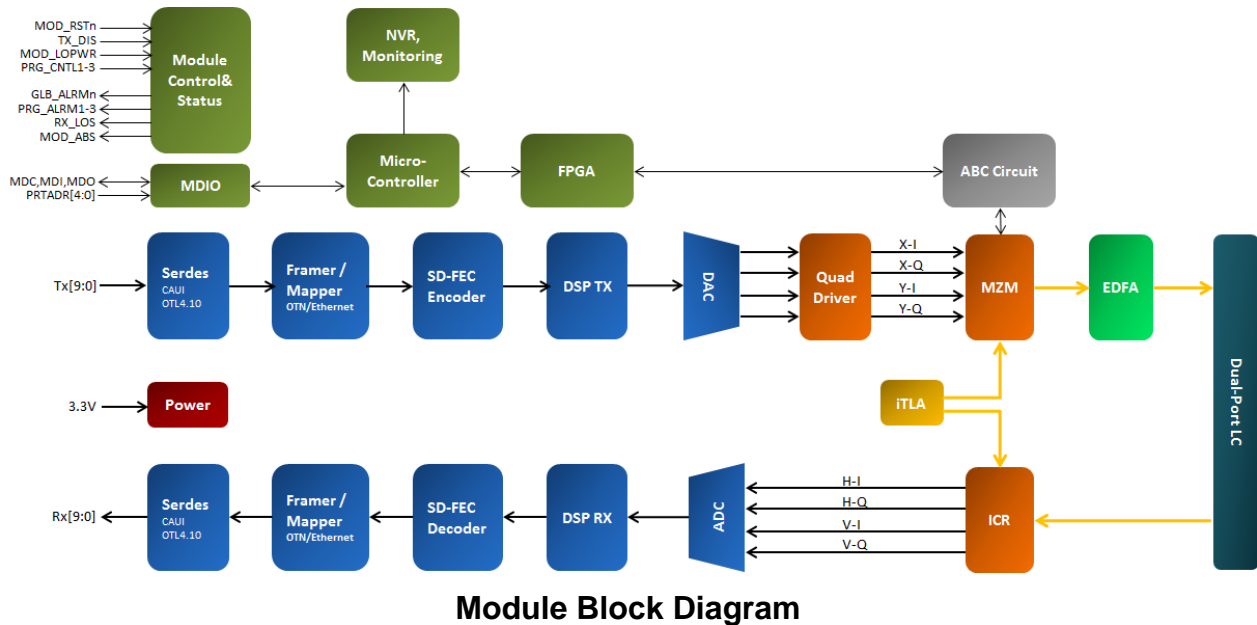
### Applications

- ◆ 100GbE IEEE 802.3bj;
- ◆ ITU-T G.709/Y.1331 for Optical transport network
- ◆ Switch to switch interface or Switch to router interface
- ◆ Access, Metro, Long-haul Ethernet DWDM Networks

### Description

The Gigalight 100G CFP DCO module is the CFP optical transponder which is a hot pluggable form factor designed for high speed optical networking application. The module is designed for 100Gigabit Ethernet and OTU4 application, CAUI and OTL4.10 electrical interface and MDIO module management interface. The module converts 10-lane OTU4/100GE electrical data streams to DP-D/QPSK optical output signal in Egress, and also converts DP-D/QPSK optical input signals to 10-lane electrical data streams in Ingress. This 10-lane electrical signal is fully compliant with 802.3ba CAUI specification and OIF-CEI-03.1

specification, and allows M6 host PCB trace up to 25cm. The block diagram is illustrated below, DSP is used for electric data signals generation and recovery, ITLA is a full C\_Band wavelength tunable assemble which is used for optical signal carrier in egress and for coherent receive in ingress, MZM is used for E-O convert in egress and ICR is used for O-E convert in ingress, the optical signals format is DP-D/QPSK, EDFA is used for optical signal amplify that we can get suitable output optical power.



## Absolute Maximum Ratings

Parameter	Symbol	Unit	Min	Max
Storage Temperature Range	Ts	°C	-40	+85
Relative Humidity	RH	%	5	85
Power Supply Voltage	Vcc	V	-0.5	+ 3.6
Operating Case Temperature Range	Tc	°C	-5	75
Receiver Optical Power	Pdag	dBm		+3

## Recommended Operating Conditions

Parameter	Symbol	Unit	Min	Typ	Max
Operating Case Temperature Range	Tc	°C	0		70
Power Supply Voltage	Vcc	V	3.2	3.3	3.4
Data rate		Gb/s		103.125	112

## Products Characteristics

(Tested under recommended operating conditions)

Parameter	Symbol	Unit	Min	Typ	Max	Notes
<b>Voltage Supply Electrical Characteristics</b>						
Supply Current		A	-	-	12	
Power Supply Noise	Vrip				2%	DC-1MHz
					3%	1-10MHz
Dissipation Class3/4	Pw	W		28	31	LH
				22	24	MR
				21	23	ZR
Low Power Dissipation	Plow	W			2	
Inrush Current <sub>n2</sub>	I-inrush mA/usec				100	
Turn-off Current <sup>Class2</sup>	I-turnoff mA/usec		-100			
<b>Different Signal Electrical Characteristics</b>						
Single Ended Data Input Swing		mV	55		525	
Single Ended Data Output Swing		mV	180		385	
Differential Signal Resistance	Output	Ω	80		120	
Differential Signal Resistance	Input	Ω	80		120	
<b>3.3V LVCMOS Electrical Characteristics</b>						
Input High Voltage	3.3VIH	V	2.0		Vcc+0.3	
Input Low Voltage	3.3VIL	V	-0.3		0.8	
Input Leakage Current	3.3IIN	uA	-10		+ 10	
Output High Voltage(I <sub>OH</sub> =100uA)	3.3VOH	V	Vcc-0.2		-	

Output Low Voltage (IoI = 100uA)	3.3VOL	V			0.2	
Minimum Pulse Width of Control Pin Signal	T_CNTL	us	100			
<b>1.2V LVCMOS Electrical Characteristics</b>						
Input High Voltage	1.2VIH	V	0.84		1.5	
Input Low Voltage	1.2VIL	V	-0.3		0.36	

Input Leakage Current	1.2IIN	uA	-100		+ 100	
Output High Voltage	1.2VOH	V	1.0		1.5	
Output Low Voltage	1.2VOL	V	-0.3		0.2	
Output High Current	1.2IOH	mA			-4	
Output Low Current	1.2IOL	mA	+4			
Input Capacitance	Ci	pF			10	

<b>Optical Transmitter Characteristics</b>						
Signaling Rate for Each Lane (100GE)		Gbps	-	25.78125+/-100ppm		100GE
Signaling Rate for Each Lane (OTU4)				27.95249+/-20ppm		OTU4
Wavelength Range	DWDM	nm	1529.16	-	1567.13	
Channel Spacing	F_SPACING	GHz	50			
Laser Tuning Range	F_TUNE	Full C-band 96				
Wavelength Accuracy	$\lambda_{EOL}$	GHz	-2	-	2	
Output Power	P_OUT	dBm	-15	0	+2	With EDFA
			-12	-8	-6	Without W DFA
Output Power Accuracy	P-a	dB	-1		1	BOL
			-2		2	EOL
Output Power Stability	Short time	dB	-0.3		0.3	

Shutdown Optical Power	POFF	dBm			-40	
Spectral Width @-20dB		GHz			50±3	
Transmitter Warm-Start Ready Time		ms		100		
Transmitter Cold-start Ready Time		s		120		
Transmitter OSNR		dB/0.1nm	35			
Transmitter Polarization Imbalance		dB	-1		1	
<b>Optical Receiver Characteristics</b>						
Receive Rate for Each Lane(100GE)		Gbps		25.78125+/-100ppm		100GE
Receive Rate for EachLane(OTU4)				27.95249+/-20ppm		OTU4
Wavelength Range	DWDM	nm	1529.16	-	1567.13	
Receiver Operating Range	Pw	dBm	-18	-	0	
Receiver B2B Optical power Sensitivity <sup>2</sup>	O_sense	dBm	-21			
LOS assert	LOS_a	dBm			-21	
LOS De-assert	LOS_d	dBm	-18			
LOS hysteresis	LOS_h	dB		0.5		
ZR OSNR ( @BER=4E-3 )	OSNRMIN	dB/0.1nm		17		HD-FEC
MR OSNR ( @BER=4E-3 )	OSNRMIN	dB/0.1nm		15.5		HD-FEC
LH OSNR ( @BER=2e-2 )	OSNRMIN	dB/0.1nm		13		SD-FEC
Chromatic Dispersion Compensation <sup>3</sup>	CD	ps/nm			2000	ZR
		ps/nm			12000	MR
		ps/nm			25000/ 40000 <sup>3</sup>	LH
Filter Tolerance	OTF	GHz	30	45		
PMD Capability (DGD)	DGD	ps			50	

PDL Tolerance	PDL	dB			3	
Polarization SOP Tracking	SOP	kHz			20	
Receiver Warm-Start Turn-Up Time		s			30	
Receiver Cold-Start Turn-Up Time		s		60		

Note1. The supply current includes CFP module's supply current in pending status.

Note2. The module will be switched into Hold-state when input power lower than -21 dBm;

Note3. Please specify the CD requirement by ordering.

## Hardware Control Pins

The CFP Module support real-time control functions via hardware pins, listed in the following table: Hardware Control Pins

Pin#	Symbol	Description	I/O	Logic	H	L	Pull-up/down
30	PRG_CNTL1	Programmable Control 1 MSADefault: TRXIC_RST n , TX&RX ICs reset,	I	3.3V LVCMOS	Per CFP MSA Management Interface Specification		Pull-Up <sup>1</sup>
31	PRG_CNTL2	Programmable Control 2 MSADefault : Hardware Interlock LSB	I	3.3V LVCMOS			Pull-Up <sup>1</sup>
32	PRG_CNTL3	Programmable Control 3 MSA Default:Hardware Interlock MSB	I	3.3V LVCMOS			Pull-Up <sup>1</sup>
36	TX_DIS	Transmitter Disable	I	3.3V LVCMOS	Disable	Enable	Pull-Up <sup>1</sup>
37	MOD_LOPW R	Module Low Power Mode	I	3.3V LVCMOS	Low Power	Enable	Pull-Up <sup>1</sup>
39	MOD_RST <sub>n</sub>	Module Reset(Invert)	I	3.3V LVCMOS	Enable	Reset	Pull-Down <sup>2</sup>

Note1: Pull-Up resistor (4.7KOhm to 10Kohm) is located within the CFP module

Note2: Pull-Down resistor (4.7KOhm to 10Kohm) is located within the CFP module

## Hardware Alarm Pins

The CFP Module supports alarm hardware pins listed in the following table: Hardware Alarm Pins

Pin#	Symbol	Description	I/O	Logic	H	L	Pull-up/down
33	PRG ALRM 1	Programmable Alarm 1 MSA Default: HIPWR_ON	O	3.3V LVCMOS	Active High per MDIO document		
34	PRG ALRM 2	Programmable Alarm 2 MSA Default: MOD_READY , Ready State has been reached	O	3.3V LVCMOS			
35	PRG ALRM3	Programmable Alarm 3 MSA Default: MOD FAULT	O	3.3V LVCMOS			
38	MOD_ABS	Module Absent	O	3.3V LVCMOS	Absent	Present	Pull-Down <sup>1</sup>
40	RX_LOS	Receiver Loss of Signal	O	3.3V LVCMOS	Loss of Signal	OK	

Note1: Pull-Down resistor (less than 100 ohm) is located within the CFP module

## Management Interface Pins (MDIO)

The CFP Module supports alarm, control and monitor functions via an MDIO bus. The CFP MDIO pins are listed in the following table: Management Interface Pins

Pin#	Symbol	Description	I/O	Logic	H	L	Pull-up/down
41	GLB_ALRMn	Global Alarm	O	3.3V LVCMOS	Ok	Alarm	
47	MDIO	Management Data Input Output Bi-Directional Data	I/O	1.2V LVCMOS			
48	MDC	MDIO Clock	I	1.2V LVCMOS			
46	PRTADR0	MDIO Physical Port address bit0	I	1.2V LVCMOS	per MDIO document		
45	PRTADR1	MDIO Physical Port address bit1	I	1.2V LVCMOS			
44	PRTADR2	MDIO Physical Port address bit2	I	1.2V LVCMOS			
43	PRTADR3	MDIO Physical Port address bit3	I	1.2V LVCMOS			
42	PRTADR4	MDIO Physical Port address bit4	I	1.2V LVCMOS			

## Hardware Signaling Pin Timing Requirements

Timing Parameters for CFP hardware Signal Pins are listed in the following table.

Parameter	Symbol	Min	Max	Unit	Notes&Conditions
Hardware MOD_LOPWR assert	t_MOD_LOPWR_assert		10	ms	Application Specific May depend on current state Condition when signal is applied
TX Disable Assert Time	T_off		10	ms	

## High Speed Clock Characteristics

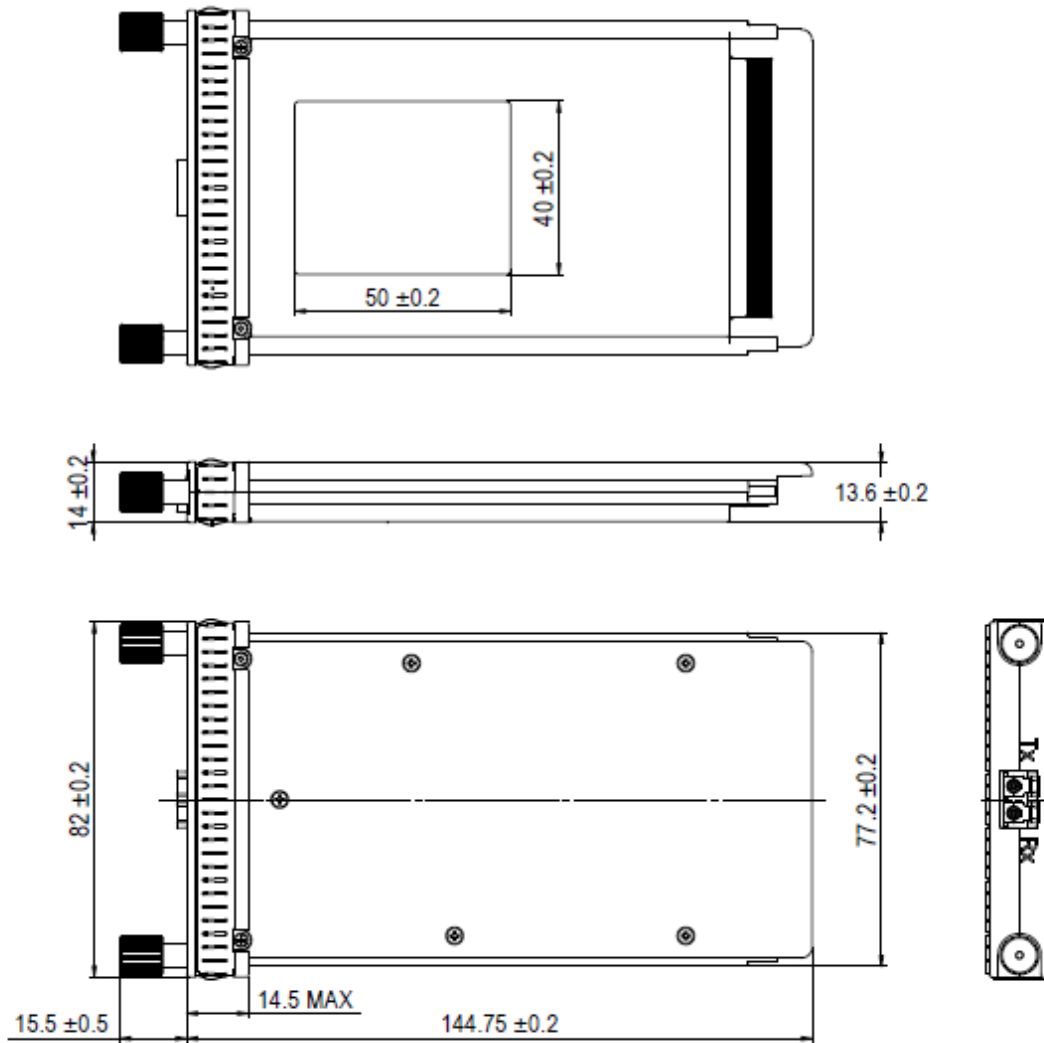
100G CFP DCO use inner REFCLK, Customer do not need to provide this clock. The output TXMONCLK is not support and the RX MONCLK characteristics is shown below

Items	Symbol	Min	Typ	Max	Units	Notes
Host Side RX_MONCLK						
Impedance	Zd	80	100	120	Ω	Differential
RXMONCLK Frequency	Freq		174.7 <sup>1</sup>		MHz	OTU4
			161.1 <sup>1</sup>			100GE
Output Differential Voltage	V-out Differential	600		1200	mV-pp	OTU4
		600		1200		100GE
Return Loss	SDD22			-12	dB	
Clock Duty Cycle		40		60	%	

Note1: Default frequency (1/64 of lane-rate), can be adjusted to 1/16 of lane-rate according to the CFP MSA (b'012).

## Mechanical Dimensions





Unit: mm

## Regulatory Compliance

Gigalight 100G CFP DCO transponders are Class 1 Laser Products. They are certified per the following standards:

Feature	Standard
Laser Safety	IEC 60825-1:2014 (3 <sup>rd</sup> Edition)
Environmental protection	2011/65/EU
CE EMC	EN55032: 2015 EN55035: 2017 EN61000-3-2:2014 EN61000-3-3:2013
FCC	FCC Part 15, Subpart B; ANSI C63.4-2014

## Ordering information

Part Number	Product Description
GCF-S101-ZR-1TCA	CFP, 100GE/OTU4,ZR,Tunable,C_band, with EDFA
GCF-S101-ZR-0TCA	CFP, 100GE/OTU4,ZR,Tunable,C_band, without EDFA
GCF-S101-MR-1TCA	CFP, 100GE/OTU4,MR,Tunable,C_band, with EDFA
GCF-S101-MR-0TCA	CFP, 100GE/OTU4,MR,Tunable,C_band, without EDFA
GCF-S101-LH-1TCA	CFP, 100GE/OTU4,LH,Tunable,C_band, with EDFA
GCF-S101-LH-0TCA	CFP, 100GE/OTU4,LH,Tunable,C_band, without EDFA

### References:

IEEE 802.3ba;

ITU-T G.709/Y.1331

RoHS 2.0 compliant (2011/65/EU, lead free)

CFP-MSA-HW-Spec-rev1-40

CFP\_MSA\_MIS\_V2p6r06a

CFP\_MSA\_Module-Dimensions\_APRIL07-10

CFP\_MSA\_Host-Mechanical-drawings

OIF-MSA-100GLH-EM-02.1

Regulation (EC) No.1907/2006(REACH)

Tested in accordance with Telcordia GR-468

IEC 60825-1:2014

EN 60825-1:2014

EN 60825-2:2004+A1+A2

FDA CDRH 21 CFR 1040

EN 60950-1:2006+A11+A1+A12+A2

EN 62368-1: 2014+A11:2017

UL 60950-1 & CAN/CSA C22.2 No. 60950-1

UL 62368-1:2014

IEC 60950-1:2005+AMD1:2009+AMD2:2013

IEC 62368-1:2014

GB 4943.1-2011

47 CFR FCC Part 15 Subpart B

EN 55032:2015

EN 55024:2010+A1:201

### CAUTION:

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

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## Revision History

Revision	Date	Description
V0	March-14-2019	Advance Release.
V1	June 22, 2019	Revise the TXMONCLK/RXMONCLK frequency; Revise TX_OSNR to minimum 35 dB; Delete MSA pins picture in page 9; Revise hardware pin sign description. Delete OSNR sensitivity of clock recovery.