

# 100G CFP2-DCO

## GF2-S101-xx-xTCA

## Features

- ✓ Operating optical data rate up to 112Gbps
- ✓ 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 17W/22W
- ✓ Commercial operating case temperature range: 0°C to 70°C
- ✓ Single 3.3V power supply
- ✓ 2\*LC Fiber connections
- ✓ CFP2 MSA compliant
- ✓ IEEE 802.3ba MAC compliant
- ✓ OTL4.4 and CAUI-4 compatible
- ✓ PRBS generation and detection for line and host interfaces
- ✓ RoHS compliant (lead free)
- ✓ ZR/LH application
- ✓ Single ITLA



## Applications

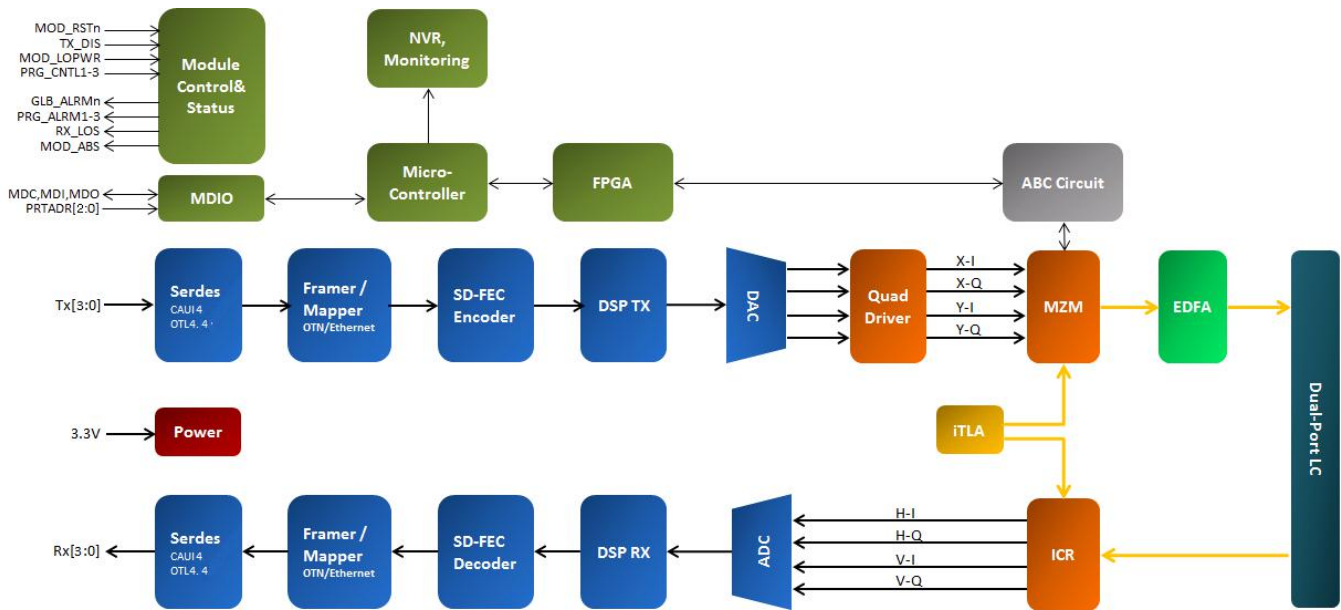
- ✓ 100G Ethernet
- ✓ OTN OTU4
- ✓ Switch to switch interface or switch to router interface
- ✓ Access, Metro, Long-haul Ethernet DWDM networks

## 100G CFP2-DCO GF2-S101-xx-xTCA

### Description

GIGALIGHT's 100G CFP2-DCO is a digital optical module designed for 100G Ethernet and OTN OTU4 high-speed optical networking application, with CAUI-4 and OTL4.4 electrical interface and MDIO module management interface. The module converts 4-lane OTU4/100G Electrical data streams to DP-D/QPSK optical output signal in Egress, and converts DP-D/QPSK optical input signals to 4-lane electrical data streams in Ingress. This 4-lane electrical signal is fully compliant with IEEE 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 to get suitable output optical power.



**Module Block Diagram**



# 100G CFP2-DCO

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### 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
Voltage Supply Electrical Characteristics						
Supply Current <sup>1</sup>	a	-	-	-	7	



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Power Supply Noise	Vrip				2%	DC-1MHz
					3%	1-10MHz
Dissipation Class3/4	P <sub>w</sub>	W		21	23	LH
				17	18	ZR
Low Power Dissipation	P <sub>low</sub>	W			2	
Inrush Current n 2	I-inrush mA/usec				100	
Turn-off Current Class2	I-turnoff mA/usec		-100			
Different Signal Electrical Characteristics						
Single Ended Data Input Swing		mV			525	
Single Ended Data Output Swing		mV	150		385	
Differential Signal Resistance	Output	Ω	80		120	
Differential Signal Resistance	Input	Ω	80		120	
3.3V LVCMOS Electrical Characteristics						
Input High Voltage	3.3V <sub>IH</sub>	V	2.0		V <sub>CC</sub> +0.3	
Input Low Voltage	3.3V <sub>IL</sub>	V	-0.3		0.8	
Input Leakage Current	3.3I <sub>IN</sub>	uA	-10		+ 10	
Output High Voltage (I <sub>OH</sub> =100uA)	3.3V <sub>OH</sub>	V	V <sub>CC</sub> -0.2		-	
Output Low Voltage (I <sub>OL</sub> =100uA)	3.3V <sub>OL</sub>	V			0.2	
Minimum Pulse Width of Control	T_CNTL	us	100			



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## 100G CFP2-DCO GF2-S101-xx-xTCA

1.2V LVCMOS Electrical Characteristics						
Input High Voltage	1.2V <sub>IH</sub>	V	0.84		1.5	
Input Low Voltage	1.2V <sub>IL</sub>	V	-0.3		0.36	
Input Leakage Current	1.2I <sub>IN</sub>	uA	-100		+ 100	
Output High Voltage	1.2V <sub>OH</sub>	V	1.0		1.5	
Output Low Voltage	1.2V <sub>OL</sub>	V	-0.3		0.2	
Output High Current	1.2I <sub>OH</sub>	mA			-4	
Output Low Current	1.2I <sub>OL</sub>	mA	+4			
Input Capacitance	C <sub>i</sub>	pF			10	
Optical Transmitter Characteristics						
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_SPACIN G	GHz	50			
Laser Tuning Range	F_TUNE	Full C-band 96				
Wavelength Accuracy	λ_EOL	GHz	-2	-	2	
Output Power	P_OUT	dBm	-15	0	+2	With EDFA adjustable
			-12	-8	-6	Without W DFA
Output Power Accuracy	P-a	dB	-1		1	BOL



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## 100G CFP2-DCO GF2-S101-xx-xTCA

			-2		2	EOL
Output Power Stability	Short time	dB	-0.3		0.3	
Shutdown Optical Power	P <sub>OFF</sub>	dBm			-40	
Spectral Width @-20dB		GHz		50	53	
Transmitter Warm-Start Ready Time		ms		100		
Transmitter Cold-start Ready Time		s		120		
Transmitter OSNR		dB/0.1 nm	35			
Transmitter Polarization Imbalance		dB	-1		1	
Optical Receiver Characteristics						
Receive Rate for Each Lane (100GE)		Gbps		25.78125+/- 100ppm		100GE
Receive Rate for Each Lane (OTU4)				27.95249+/- 20ppm		OTU4
Wavelength Range	DWDM	nm	1529.16	-	1567.13	
Receiver Operating Range	P <sub>w</sub>	dBm	-18	-	0	
Receiver B2B Optical power Sensitivity <sup>2</sup>	O <sub>sense</sub>	dBm	-21			
LOS assert	LOS <sub>a</sub>	dBm			-21	
LOS De-assert	LOS <sub>d</sub>	dBm	-18			
LOS hysteresis	LOS <sub>h</sub>	dB		0.5		
ZR OSNR (@BER=4E-3)	OSNR <sub>MIN</sub>	dB/0.1 nm		17		HD-FEC
LH OSNR (@BER=2E-2)	OSNR <sub>MIN</sub>	dB/0.1 nm		13		SD-FEC

## 100G CFP2-DCO GF2-S101-xx-xTCA

Chromatic Dispersion Compensation <sup>3</sup>	CD	ps/nm			2000	ZR
		ps/nm			25000/ 400003	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		

### Notes:

1. The supply current includes CFP2 module's supply current in pending status.
2. The module will be switched into Hold-state when input power lower than -21dBm.
3. Please specify the CD requirement by ordering.

## Hardware Control Pins

The CFP2 Module support real-time control functions via hardware pins, listed in the following table:

Pin#	Symbol	Description	I/O	Logic	H	L	Pull-up/down
17	PRG_CNTL1	Programmable Control 1 MSA Default: TRXIC_RST n , TX&RX ICs reset, "0": reset; "1"	I	3.3V LVCMOS	Per CFP2 MSA Management Interface Specification		Pull-Up <sup>1</sup>
18	PRG_CNTL2	Programmable Control 2 MSA Default: Hardware Interlock LSB	I	3.3V LVCMOS			Pull-Up <sup>1</sup>

## 100G CFP2-DCO GF2-S101-xx-xTCA

19	PRG_CNTL3	Programmable Control 3 MSA Default: Hardware Interlock MSB	I	3.3V LVCMOS			Pull-Up <sup>1</sup>
24	TX_DIS	Transmitter Disable	I	3.3V LVCMOS	Disable	Enable	Pull-Up <sup>1</sup>
26	MOD_LOPWR	Module Low Power Mode	I	3.3V LVCMOS	Low Power	Enable	Pull-Up <sup>1</sup>
28	MOD_RSTn	Module Reset (Invert)	I	3.3V LVCMOS	Enable	Reset	Pull-Down <sup>2</sup>

### Notes:

1. Pull-Up resistor (4.7KOhm to 10KOhm) is located within the CFP2 module.
2. Pull-Down resistor (4.7KOhm to 10KOhm) is located within the CFP2 module.

## Hardware Alarm Pins

The CFP2 Module supports alarm hardware pins listed in the following table:

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

### Notes:

1. Pull-Down resistor (less than 100ohm) is located within the CFP2 module.



## 100G CFP2-DCO GF2-S101-xx-xTCA

### Management Interface Pins (MDIO)

The CFP2 Module supports alarm, control and monitor functions via an MDIO bus. The CFP2 MDIO pins are listed in the following table:

Pin#	Symbol	Description	I/O	Logic	H	L	Pull-up/down
29	GLB_ALRMn	Global Alarm	O	3.3V LVC MOS	Ok	Alarm	
32	MDIO	Management Data Input Output Bi-Directional Data	I/O	1.2V LVC MOS			
31	MDC	MDIO Clock	I	1.2V LVC MOS			
33	PRTADR0	MDIO Physical Port address bit0	I	1.2V LVC MOS	per MDIO document		
34	PRTADR1	MDIO Physical Port address bit1	I	1.2V LVC MOS			
35	PRTADR2	MDIO Physical Port address bit2	I	1.2V LVC MOS			

### Hardware Signaling Pin Timing Requirements

Timing Parameters for CFP2 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	



# 100G CFP2-DCO GF2-S101-xx-xTCA

## High Speed Clock Characteristics

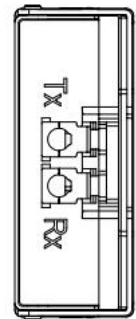
100G CFP2-DCO use inner REFCLK, Customer do not need to provide this clock. The output TX\_MONCLK is not support and the RX\_MONCLK characteristics is shown below.

Items	Symbol	Min	Typ	Max	Units	Notes
Host Side RX_MONCLK (Optional)						
Impedance	Zd	80	100	120	$\Omega$	Differential
RX_MONCLK Frequency	Freq		1.164		GHz	OTU4
			1.074			100GE
Output Differential Voltage	V-out Differential	800		1200	mV-pp	OTU4
		800		1200		100GE
Return Loss	SDD22			-12	dB	

100G CFP2-DCO  
GF2-S101-xx-xTCA

Mechanical Dimensions

Unit (mm), General Tolerance:  $\pm 0.1$  mm



# 100G CFP2-DCO

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## Regulatory Compliance

GIGALIGHT's 100G CFP2-DCO modules are Class 1 Laser products. They are certified per the following standards:

Feature	Standard
Laser Safety	IEC 60825-1: 2014 (3rd 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
GF2-S101-ZR-1TCA	100G CFP2-DCO ZR, 100GE/OTU4, C-band Tunable, 120km, with EDFA
GF2-S101-ZR-0TCA	100G CFP2-DCO ZR, 100GE/OTU4, C-band Tunable, 120km, without EDFA
GF2-S101-LH-1TCA	100G CFP2-DCO LH, 100GE/OTU4, C-band Tunable, 2000km, with EDFA
GF2-S101-LH-0TCA	100G CFP2-DCO LH, 100GE/OTU4, C-band Tunable, 2000km, without EDFA

# 100G CFP2-DCO

## GF2-S101-xx-xTCA

### References:

- ✓ IEEE 802.3ba;
- ✓ ITU-T G.709/Y.1331
- ✓ RoHS 2.0 compliant (2011/65/EU, lead free)
- ✓ CFP2-MSA-HW-Spec-rev1.0
- ✓ CFP\_MSA\_MIS\_V2p6r06a
- ✓ CFP2\_MSA\_Module-Dimensions\_APRIL07-10
- ✓ CFP2\_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	Sep-08-2020	Advance Release.