200G CFP2 DCO

GF2-S201-ZR-xTC

Feature

- Supports 100 Gbps DP-QPSK and 200 Gbps DP-8QAM/ DP-16QAM modulations
- Flexible client side interfaces supporting: – OTL4.4 signaling for OTU4 frames with G.709 FEC and OTU4/ ODU monitoring; – CAUI-4 signaling for 100G Ethernet with RMON counter module
- Interoperable staircase FEC and low latency 15% soft decision FEC support
- Support for Nyquist spectral shaping and digitally compensated CD and PMD
- Flex-grid DWDM support with gridless tuning (100 MHz resolution)
- Embedded PRBS generator/analyzer for line and client interfaces and loopback of incoming and outgoing traffic
- Standard CFP2 form factor module outline (106 x 41.5 x 12.4 mm)
- Operating case temperature from -5℃ to +70℃
- Single 3.3 V supply

Applications

- 100/200G loss-limited point-to-point edge unamplified coherent transmission
- 100/200G OSNR-limited metro, regional, and long haul coherent transmission with link

Description

The 200G per wavelength CFP2 digital coherent optical transceiver incorporates co-packaged indium phosphide (InP) PICs including narrow linewidth tunable laser, both the InP Mach-Zehnder modulator and the micro-intradyne coherent receiver (μICR) with integrated VOA, together with the industry's most interoperable digital signal processing (DSP)ASICs tosupport 100GPM-QPSK and 200GPM-8/16QAM transmissions. The CFP2-DCO module adopts a common C-band flex-grid laser source providing both transmitter and local oscillator signals ±6 GHz local off-grid tuning.

The transmitter comprises of bulk optics lightwave multiplexing and the IQ Mach-Zehnder modulator with integrated SOAs internally coupled with a quad channel modulator driver IC.

The receiver comprises optics demultiplexing, dual InP 90°optical hybrid mixers with integrated balanced PIN photo-detectors coupled with a quad channel TIA. An IEEE802.3 Clause 45 compliant MDIO management interface is used for control, alarms, monitoring, and diagnostics. The module mechanical outline is the standard CFP2 MSA size (106 mm x 41.5 mm x 12.4 mm). Electrical interfaces are provided through the 104-pin connector and optical interfaces through two LC optical receptacle connectors.

Compliance

- CFP MSA IEEE802.3 Clause 45 MDIO
- 104-pin CFP2 MSA-compliant connector
- RoHS

Optical Characteristics

The following parametric limits apply to all channels, over life and for a case temperature range of -5℃ to 70℃.

Parameter	Measurement Conditions	Minimum	Typical	Maximum	Unit
Transmitter					
Baud rate	Per IQ modulator	27.95		43	GBaud
Mean modulated output power	DP_QPSK	-5		1	dBm
Mean modulated output power	DP-8QAM	-5		1	dBm
Mean modulated output power	DP-16QAM	-5		1	dBm
Shutteredoutputpower				-35	dBm
Wavelength range		1528.77		1568.36	nm

Parameter	Measurement Conditions	Minimum	Typical	Maximum	Unit
Frequencyrange		191.150		196.100	THz
Default channel grid spacing	Tunable across C-band		50		GHz
Fine tune frequency resolution		0.1			GHz
Frequencystability		-1.5		+1.5	GHz
On-grid tuning range	Unshuttered tuning	-6		+6	GHz
Lorentzian linewidth	Tx and LO		300		kHz
OSNR	Inband	35			dB
OSNR	Outband	42			dB
Optical transmitter turn on time1	Warmstart			1	s
Optical transmitter turn on time1	Cold start			90	s
Optical transmitter turn off time	From TX_DIS activated			10	ms
Transmitter channel tuning				60	s
Optical return loss	Towards the module	27			dB
Receiver					
Frequencyrange		191.150		196.100	THz
Maximum optical input power				+13	dBm
Optimum Input power range	100G QPSK, 200G 8QAM, 200G 16QAM	-18		0	dBm
VOA range	On input signal			10	dB
VOA step size				0.4	dB
VOA response time				100	ms
Signal input monitor accuracy		-2.5		+2.5	dB

Parameter	Measurement Conditions	Minimum	Typical	Maximum	Unit
Optical return loss				27	dB
Required OSNR DP-QPSK (10^{-15}post FEC error rate)	SDFEC		12		dB/0.1 nm
Required OSNR DP-8QAM (10^{-15} post FEC error rate)	SDFEC		18		dB/0.1nm
Required OSNR DP-16QAM (10^{-15} post FEC error rate)	SDFEC		20		dB/0.1nm
Chromatic dispersion tolerance	QPSK			16	ns/nm
	8QAM			20	
	16QAM			16	
DGD tolerance	QPSK			90	ps
	8QAM			45	ps
	16QAM			45	ps
SOPMD tolerance	QPSK		2500		ps^2
	8QAM		2500		ps^2
	16QAM		1000		ps^2
Acquisition time				30	ms

Note:

1. Absolute tuning speed dependent on required power/wavelength mask requirements

Power Supplies

Values below are applicable over life and operating temperature range.

Parameter	Symbol	Minimum	Typical	Maximum	Unit
+3.3 V Supply voltage	V	3.2	3.3	3.4	V
+3.3 V Supply current (Max current per power supply pin)	I			1.25	A
Power dissipation -5℃ to 70℃	P				

Parameter	Symbol	Minimum	Typical	Maximum	Unit
QPSK with HDFEC			17.5		W
QPSK with SDFEC			19.5		W
8QAM			24		W
16QAM			22.5		W

Recommended operating conditions

Parameter	Symbol	Minimum	Typical	Maximum	Unit
+3.3 V Supply voltage	V cc	3.2	3.3	3.4	V
Operating case temperature (long term)	Tcase	-5		70	℃
Operating case temperature (short term)	Tcase	-5		75	℃

Environmental and Maximum Ratings The module shall withstand the conditions over the ranges specified below without damage or adverse effects on reliability. These ratings are those within which the modules expected lifetime is guaranteed. Stresses beyond those listed may cause permanent damage to the device or adversely affect the module reliability.

Parameter	Test Condition	Symbol	Minimum	Typical	Maximum	Unit
+3.3V Supply voltage		V cc			3.6	V
Input voltage			-0.3		V +0.5cc	V
RX input power1		Prx			20	dBm
Operating relative humidity2		RHop	5		85	%
Storage temperature		Ttrs	-40		+85	℃
Storage / Transportation RH		RHst	5		93	%

Note:

1. This should be considered an operating fault condition experienced for only short timeframe and should not result in damage; above it could risk damage.
2. Constant humidity ratio of 0.026 kg water/kg dry air not to be exceeded according to GR-63

Electrical Interfaces

The electrical interfaces from the module to the host card are provided through a 104-way CFP2 MSA connector which carries all power supplies, signaling and control data for both transmit and receive data paths. The following tables detail the electrical interface signal descriptions for the module. All signal directions are defined relative to the module.

Pin	Name	Type	I/O	Signal Description
2	OHIO_RDn	See Electrical Specs [1]	O	OHIO Outputs Feeding Receiver FPGA. Interface is AC coupled inside the module
3	OHIO_RDp	See Electrical Specs [1]	O	OHIO Outputs Feeding Receiver FPGA. Interface is AC coupled inside the module
5	OHIO_TDn	See Electrical Specs [1]	I	OHIO Inputs from Transmitter FPGA. Interface is AC coupled, biased and terminated inside the module
6	OHIO_TDp	See Electrical Specs [1]	I	OHIO Inputs from Transmitter FPGA. Interface is AC coupled, biased and terminated inside the module
15	HOST_INT	3.3V LVCMOS	O	Encryption key exchange protocol interrupt output from the DCO to host card
16	SWCLK	1.8V CMOS	I/O	Do not connect on host line card
17	PRG_CNTL1	3.3V LVCMOS	I	Internally 10K pull-up, Hardware interlock = 1
18	PRG_CNTL2	3.3V LVCMOS	I	Internally 10K pull-up. Can beused as PM_SYNCinput. Usedto synchronize multiple CFP2 for performance monitoring.
19	PRG_CNTL3	3.3V LVCMOS	I	Internally 10K pull-up, Hardware interlock = 1
20	PRG_ALRM1	3.3V LVCMOS	O	Programmable alarm. A c t i v e h i g h , MSA default: HIPWR_ON HIPWR_ON='1'=module powered. HIPWR = '0' =module not powered up
21	PRG_ALRM2	3.3V LVCMOS	O	Programmable alarm. Active high, MSA default: Ready State MOD_READY ='1'=module ready. MOD_READY = '0' =module not ready.
22	PRG_ALRM3	3.3V LVCMOS	O	Programmable alarm. MSA default: Fault State MODFAULT='1'=module faulty. MODFAULT ='0'= module has no fault.
24	TX_DIS	3.3V LV_CMOS	I	Transmitter disable pin (active high). Pull up.

Pin	Name	Type	I/O	Signal Description
25	RX_LOS	3.3V LVCMOS	O	Receiverlossofoptical signal. '1'=lossof signal. '0'isnormalcondition
26	MOD_LOPWR	LVCMOS	I	Module low power mode. '1'or n/c = low power (safe) mode. '0'= full operation. Pull up resistor.
27	MOD_ ABS	GND	O	GND=Module present. Module absent='1' or n/c.
28	MOD_RSTn	3.3V LVCMOS	I	Module reset='0' to reset module. '1' = module enabled. Pull down resistor in module
29	GLB_ALRMn	3.3V LVCMOS	O	Global alarm. '0'=alarm is any MDIO alarm register. '1' = no alarm. Open drain with pull up on host.
31	MDC	1.2V CMOS	I	CMOS Management Data Clock (electrical specs as per IEEE Std 802.3-2012)
32	MDIO	1.2V CMOS	I/O	Management Data I/O bi-directional data (electrical specs as per IEEE Std 802.3-2012)
33	PRTADR[0]	1.2V LVCMOS	I	MDIO physical port address bit [0]
34	PRTADR[1]	1.2V LVCMOS	I	MDIO physical port address bit [1]
35	PRTADR[2]	1.2V LVCMOS	I	MDIO physical port address bit [2]
36	SWDIO	1.8V CMOS	I/O	Do not connect to host line card
37	BER threshold alarm	3.3V LVCMOS	O	MSA BER Threshold, Connect to FPGA
38	DSP_UART0_TX	3.3V LVCMOS	I/O	Do not connect on the host line card
47	OHIO_REFCLKn	See Electrical Specs [1]	I	Internally AC Coupled, Terminated and Biased
48	OHIO_REFCLKp	See Electrical Specs [1]	I	Internally AC Coupled, Terminated and Biased
50	ENCRYPT_UART_RX	3.3V LVCMOS	I	Encryption key exchange and must be driven by the host line card if datapath encryption enabled
51	ENCRYPT_UART_TX	3.3V LVCMOS	O	Encryption key exchange and must be received by host line card is datapath encryption enabled
N/A	TX0_[3:0]		Inputs	Transmit Data Input, CAUI-4 client data signals or OTL4.4 client data
N/A	TX1_[3:0]		Inputs	Transmit Data Input, CAUI-4 client data signals or OTL4.4 client data
N/A	RX0_[3:0]		Outputs	Receive Data Output, CAUI-4 client data signals or OTL4.4 client data

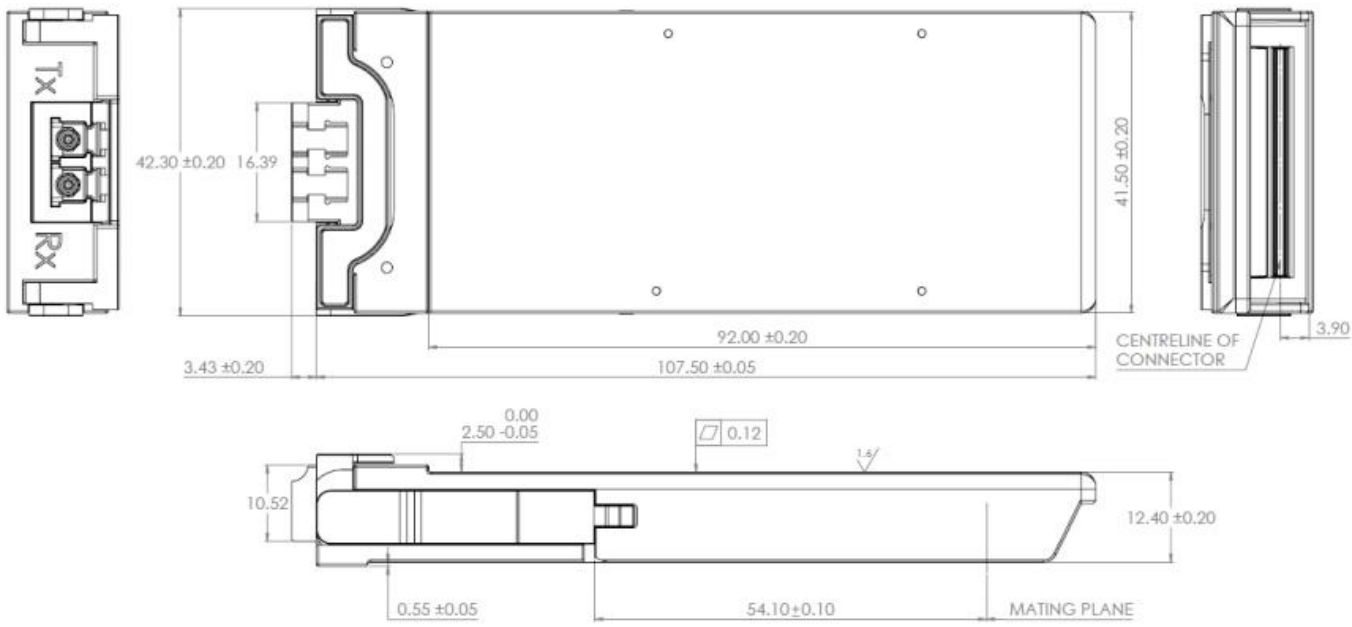
Pin	Name	Type	I/O	Signal Description
N/A	RX1_[3:0]		Outputs	Receive Data Output, CAUI-4 client data signals or OTL4.4 client data
79	REFCLKn		I	Not supported, do not connect to host line card
78	REFCLKp		I	Not supported, do not connect to host line card

Note:

1. For additional electrical specifications refer to the CFP2-DCO Product Specification
2. Pull up/down resistors are 4.7k – 10kΩ

Management Features

The CFP2-DCO module uses the MDIO interface as specified in the CFP MSA Interface Specification and IEEE802.3 Clause 45. Supported Functions Line monitors for BER, correctable Errors, uncorrectable Errors, CD, DGD, and frequency offset PRBS generators and analyzers on line and client side (PRBS7, PRBS15, PRBS31) Client loopback of incoming and outgoing traffic Package Dimensions in mm (nominal)



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