

100GBASE-SR10 & OTU4 400m CFP Optical Transceiver GCF-M101-SR10C

Features

- ✓ Hot-pluggable CFP form factor
- ✓ 10 channels full-duplex transceiver module
- ✓ Supports 111.8Gb/s aggregate bit rate
- ✓ 10 channels 850nm VCSEL array channels
- ✓ 10 channels PIN photo detector array
- ✓ TX input and RX output CDR retiming
- ✓ 8W maximum power dissipation
- ✓ Maximum link length of 300m on OM3 MMF or 400m on OM4 MMF
- ✓ Single MTP/MPO receptacle
- ✓ Built-in digital diagnostic functions
- ✓ Operating case temperature range: 0 to 70°C
- ✓ Single 3.3V power supply
- ✓ RoHS-6 compliant (lead free)



Applications

- ✓ 100GBASE-SR10 100G Ethernet
- ✓ OTN OTU4 applications

Description

The GigaLight 100GBASE-SR10 & OTU4 400m CFP optical transceiver, 100G CFP SR10/OTU4 (GCF-M101-SR10C) is a high-performance, low-power consumption, short-reach(1m to 100m) interconnect solution supporting 100G Ethernet and Telecom. It is compliant with the CFP MSA and IEEE P802.3ba 100GBASE-SR10. GigaLight CFP SR10 modules offer 10 transmit and 10 receive asynchronous channels operating at up to 11.18Gbps per channel. The CFP optical transceiver module are a high performance, low power consumption, short-reach(1m to 100m) interconnect solution.

As shown in Figure 1, the transmitter side of the module consists of an array of VCSELs (Vertical Cavity Surface Emitting Lasers) and associated circuitry, which converts 10

parallel electrical data inputs to 10 parallel optical data output signals and also converts 10 parallel optical signals into 10 parallel electrical signals through an array of PIN photodiodes and associated circuitry. The refclk clock of 161.1328M for 100GE (or 174.6875M for OTU4) is necessary.

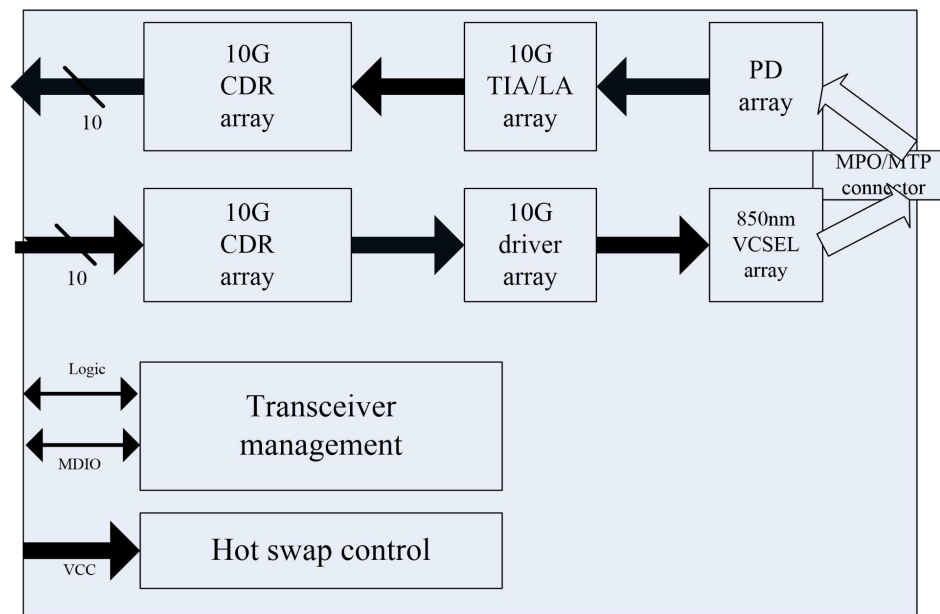


Figure 1: Module Block Diagram

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V_{cc}	-0.5	3.6	V
Storage Temperature	T_s	-40	85	°C
Case Operating Temperature	T_c	0	70	°C
Humidity (non-condensing)	Rh	5	85	%
Input Voltage	V_{in}	-0.3	$V_{cc}+0.3$	V

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Supply Voltage	V_{cc}	3.13	3.3	3.47	V
Operating Case Temperature	T_c	0		70	°C
Data Rate			103.125	111.8	Gb/s
Power Dissipation	P_m			8	W

Electrical Characteristics

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Differential Input Impedance	Z_{in}	90	100	110	ohm	
Differential Output Impedance	Z_{out}	90	100	110	ohm	
Differential Input Voltage Amplitude	ΔV_{in}	120		820	mVp-p	
Differential Output Voltage	ΔV_{out}	300		820	mVp-p	
Input Logic Level High	V_{IH}	2.0		$V_{cc}+0.3$	V	3.3V LVCOMS
		0.84		1.2	V	1.2V LVCOMS
Input Logic Level Low	V_{IL}	-0.3		0.8	V	3.3V LVCOMS
		-0.3		0.36	V	1.2V LVCOMS
Output Logic Level High	V_{OH}	$V_{cc}-0.2$		VCC	V	3.3V LVCOMS
		1.0		1.5	V	1.2V LVCOMS
Output Logic Level Low	V_{OL}	0		0.2	V	3.3V LVCOMS
		-0.3		0.2	V	1.2V LVCOMS

Note:

1. Measured between TxnP and TxnN.
2. Measured between RxnP and RxnN.

Optical Characteristics

Transmitter Optical Specifications (T = 25°C, VCC =3.3V +/- 5%)

Parameter	Symbol	Min	Typical	Max	Unit
Transmitter (each lane)					
Average Optical Power ¹	P _{out}	-7.6	-1	+2.4	dBm
Average Optical Power - Disabled	P _{off}			-30	dBm
Optical Return Loss Tolerance	T _{RL}			12	dB
Extinction Ratio	ER	3			dB
Center Wavelength	λ _c	840	850	860	nm
RMS Spectral Width	λ		0.5	0.65	nm
Transmit OMA	TX_OMA	-5.6		3	dBm
Difference in Launch Power between Any Two Lanes (OMA)				4	dB
Transmitter and Dispersion Penalty	TDP			3.5	dB
Transmitter Eye Mask	Compliant to IEEE802.3ba eye mask specification				
Receiver (each lane)					
Optical Power Sensitivity ²	P _{in min}		-12	-9.9	dBm
Optical Power Saturation	P _{in max}	2.4			dBm
Stressed Receiver Sensitivity	P _S			-5.4	dBm
Center Wavelength	λ _c	840	850	860	nm
RMS Spectral Width	λ		0.5	0.65	nm
Optical Return Loss	RL	12			dB
Damage Threshold	TH _d	3.4			dBm
Optical Modulation Amplitude	OMA			3	dBm

Note:

1. Measured at the output of the modules optical interface.
2. Measured with BER@10⁻¹² at 10.3125Gb/s per channel.

Functional Block Diagram

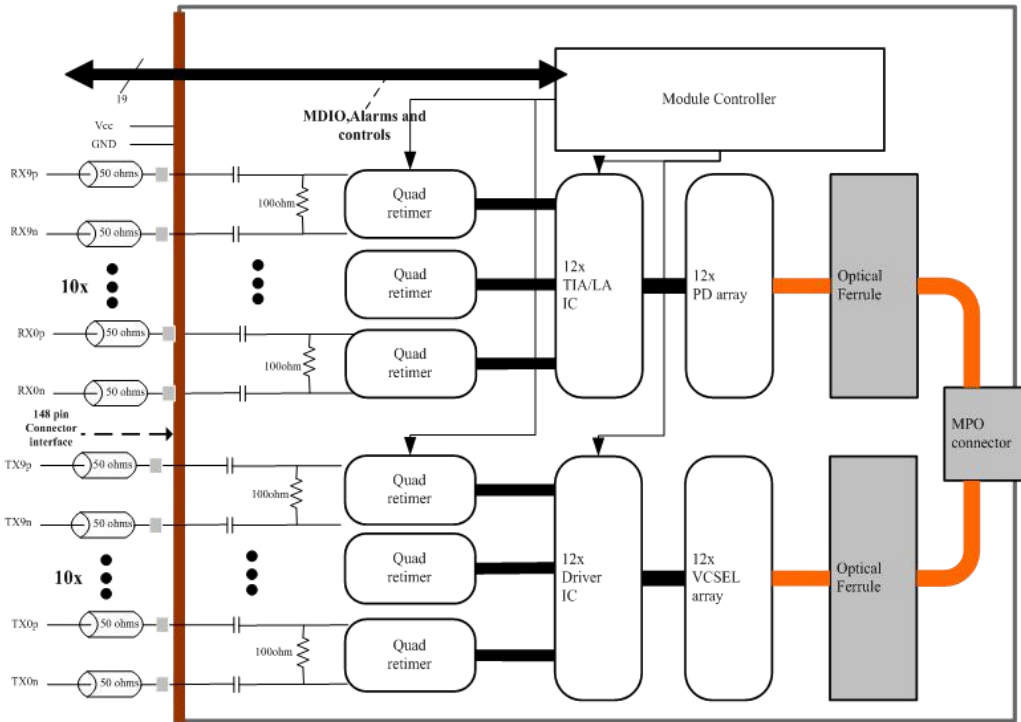


Figure 2: Functional Block Diagram

Pin Descriptions

Part A: Bottom Row Pin Function Definition

Pin	Symbol	Type	I/O	Description
1	3.3V_GND	GND		3.3V Module Supply Voltage Return Ground, can be separate or tied together with Signal Ground
2	3.3V_GND	GND		
3	3.3V_GND	GND		
4	3.3V_GND	GND		
5	3.3V_GND	GND		
6	3.3V	VCC		3.3V Module Supply
7	3.3V	VCC		
8	3.3V	VCC		
9	3.3V	VCC		
10	3.3V	VCC		
11	3.3V	VCC		
12	3.3V	VCC		
13	3.3V	VCC		
14	3.3V	VCC		
15	3.3V	VCC		

16	3.3V_GND	GND		
17	3.3V_GND	GND		
18	3.3V_GND	GND		
19	3.3V_GND	GND		
20	3.3V_GND	GND		
21	NC		I/O	Gigalight internal, do not connect
22	NC		I/O	Gigalight internal, do not connect
23	GND	GND		
24	(TX_MCLKn)	CML	O	CML For optical waveform testing. Not used.
25	(TX_MCLKp)	CML	O	CML For optical waveform testing. Not used.
26	GND	GND		
27	NC		I/O	Gigalight internal, do not connect
28	NC		I/O	Gigalight internal, do not connect
29	NC		I/O	Gigalight internal, do not connect
30	PRG_CNTL1	LVC MOS w/PU	I	Programmable Control 1 set via MDIO, MSA default: TRXIC_RSTn – TX & RX IC reset. "0" = reset, "1" or NC = enabled or not used
31	PRG_CNTL2	LVC MOS w/PU	I	Programmable Control 2 set via MDIO, MSA default: Hardware power Interlock LSB, "00" = <8W, "01" = <16W, "10" < 24W, "11" or NC = >24W or not used
32	PRG_CNTL3	LVC MOS w/PU	I	Programmable Control 3 set via MDIO, MSA default: Hardware power Interlock MSB, "00" = <8W, "01" = <16W, "10" < 24W, "11" or NC = >24W or not used
33	PRG_ALARM1	LVC MOS	O	Programmable Alarm 1 set via MDIO, Reflex default: HIPWR_ON, Module power on indicator. "1" = Module high power up completed, "0" = Module not high powered up
34	PRG_ALARM2	LVC MOS	O	Programmable Alarm 2 set via MDIO, Reflex default: MOD_READY, module initialization complete, "1" = complete, "0" = not complete
35	PRG_ALARM3	LVC MOS	O	Programmable Alarm 3 set via MDIO, Reflex default: MOD_FAULT, module fault detected, "1" = fault, "0" = no fault
36	TX_DIS	LVC MOS w/PU	I	Transmitter Disable for all channels, "1" or NC = transmitter disabled, "0" = transmitter enabled
37	MOD_LOPWR	LVC MOS w/PU	I	Module low power mode. "1" or NC = module in low power (safe) mode, "0" = power-on enabled
38	MOD_ABS	GND	O	Module Absent. "1" or NC = Module absent, "0" = module present. Pull-up resistor on Host
39	MOD_RSTn	LVC MOS w/PD	I	Module Reset. "0" = reset the module, "1" or NC = module enabled, Pull Down resistor in module
40	RX_LOS	LVC MOS	O	Receiver loss of optical signal on any channel, "1" = loss of signal, "0" = normal condition
41	GLB_ALARMn	LVC MOS	O	Global Alarm. "0" = alarm condition in any MDIO alarm register, "1" = no alarm
42	PRTADR4	1.2V CMOS	I	MDIO port address bit 4
43	PRTADR3	1.2V CMOS	I	MDIO port address bit 3
44	PRTADR2	1.2V CMOS	I	MDIO port address bit 2
45	PRTADR1	1.2V CMOS	I	MDIO port address bit 1
46	PRTADR0	1.2V CMOS	I	MDIO port address bit 0

47	MDIO	1.2V CMOS	I/O	Management Data I/O bi-directional data (electrical specs as per 802.3ae)
48	MDC	1.2V CMOS	I	Management data clock (electrical specs as per 802.3ae)
49	GND	GND		
50	NC		I/O	Gigalight internal, do not connect
51	NC		I/O	Gigalight internal, do not connect
52	GND	GND		
53	NC		I/O	Gigalight internal, do not connect
54	NC		I/O	Gigalight internal, do not connect
55	3.3V_GND	GND		3.3V Module Supply Voltage Return Ground, can be separate or tied together with Signal Ground
56	3.3V_GND	GND		
57	3.3V_GND	GND		
58	3.3V_GND	GND		
59	3.3V_GND	GND		
60	3.3V	VCC		3.3V Module Supply
61	3.3V	VCC		
62	3.3V	VCC		
63	3.3V	VCC		
64	3.3V	VCC		
65	3.3V	VCC		
66	3.3V	VCC		
67	3.3V	VCC		
68	3.3V	VCC		
69	3.3V	VCC		
70	3.3V_GND	GND		
71	3.3V_GND	GND		
72	3.3V_GND	GND		
73	3.3V_GND	GND		
74	3.3V_GND	GND		

Part B: Top Row Pin Function Definition

Pin	Symbol		Pin	Symbol
148	GND		111	GND
147	Refclk _n		110	Not used
146	Refclk _p		109	Not used
145	GND		108	GND
144	Not used		107	RX9 _n
143	Not used		106	RX9 _p
142	GND		105	GND
141	TX9 _n		104	RX8 _n
140	TX9 _p		103	RX8 _p
139	GND		102	GND
138	TX8 _n		101	RX7 _n
137	TX8 _p		100	RX7 _p
136	GND		99	GND
135	TX7 _n		98	RX6 _n

134	TX7p		97	RX6p
133	GND		96	GND
132	TX6n		95	RX5n
131	TX6p		94	RX5p
130	GND		93	GND
129	TX5n		92	RX4n
128	TX5p		91	RX4p
127	GND		90	GND
126	TX4n		89	RX3n
125	TX4p		88	RX3p
124	GND		87	GND
123	TX3n		86	RX2n
122	TX3p		85	RX2p
121	GND		84	GND
120	TX2n		83	RX1n
119	TX2p		82	RX1p
118	GND		81	GND
117	TX1n		80	RX0n
116	TX1p		79	RX0p
115	GND		78	GND
114	TX0n		77	Not used
113	TX0p		76	Not used
112	GND		75	GND

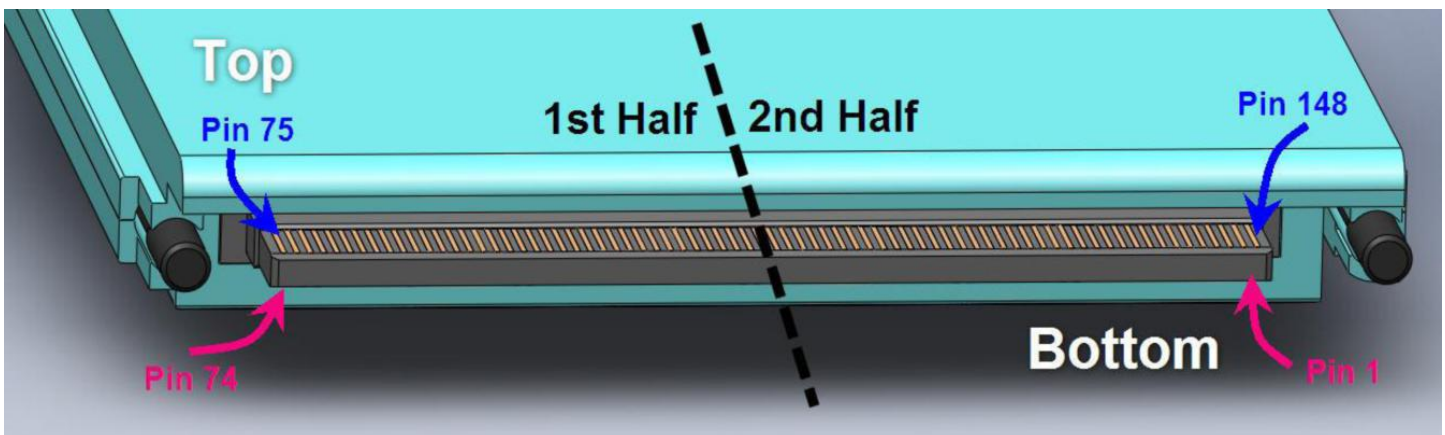


Figure 3: Pad Layout

Optical Interface Lanes and Assignment

Figure 4 shows the orientation of the multimode fiber facets of the optical connector.

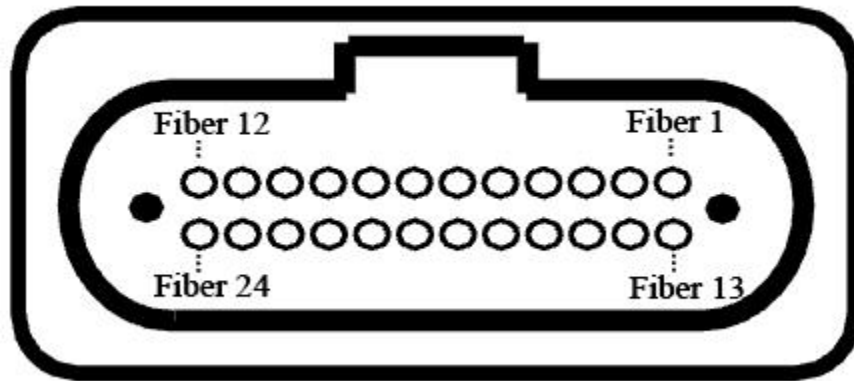


Figure 4: Outside View of the CFP Module MPO Receptacle

Lane Assignment

Fiber	Symbol	Corresponding Electrical pins	Fiber	Symbol	Corresponding Electrical pins
1	Unused		13	Unused	
2	RX0	79,80	14	TX0	113,114
3	RX1	82,83	15	TX1	116,117
4	RX2	85,86	16	TX2	119,120
5	RX3	88,89	17	TX3	122,123
6	RX4	91,92	18	TX4	125,126
7	RX5	94,95	19	TX5	128,129
8	RX6	97,98	20	TX6	131,132
9	RX7	100,101	21	TX7	134,135
10	RX8	103,104	22	TX8	137,138
11	RX9	106,107	23	TX9	140,141
12	Unused		24	Unused	

Mechanical Dimensions

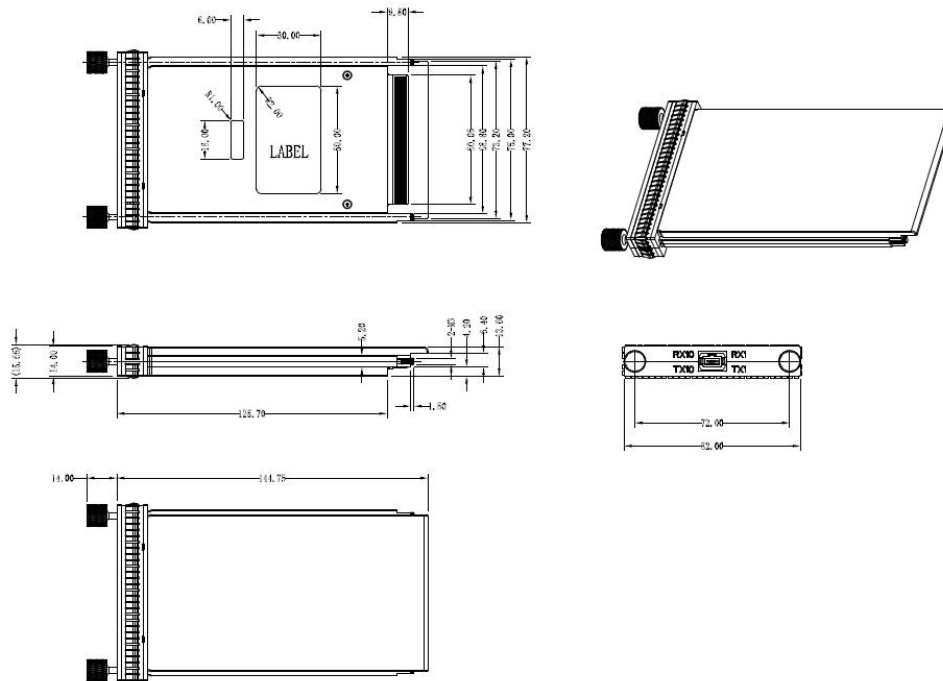


Figure 5: Mechanical Specifications

Ordering information

Product Description	Part Number
CFP SR10, 111.8Gb/s, 850nm, 400m, MMF, MTP/MPO	GCF-M101-SR10C

References:

1. 100GBASE-SR10 100G Ethernet
2. OTN OTU4
3. CFP MSA

ESD:

This transceiver is specified as ESD threshold 1kV for SFI pins and 2kV for all other electrical input pins, tested per MIL-STD-883, Method 3015.4 /JESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected environment.

Laser Safety:

This is a Class 1 Laser Product according to IEC 60825-1:2007. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007).

Important Notice:

Performance figures, data and any illustrative material provided in this data sheet are typical and must be specifically confirmed in writing by GigaLight before they become applicable to any particular order or contract. In accordance with the GIGALIGHT policy of continuous improvement specifications may change without notice.

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Revision History

Revision	Level	Date	Description
V0	Preliminary	Mar 2017	Advance Release.