

# SO-CFP-ER4-DWDM

CFP, 103/112 Gbps, DWDM tunable, SM, DDM, 20 km

## OVERVIEW

The SO-CFP-ER4-DWDM is a 100G transceiver module supporting 100GBASE-LR4 and OTU4 applications over single mode (SM) fiber. It has a transmission distance of 20km which can be extended to 150km when used together with M-Series platform. A tunable CFP DWDM transceiver combines 4x28Gbps reduced bandwidth modulation format and 50GHz full C-band tuneability into a CFP MSA compliant package. The tunable CFP is designed to interoperate with any Open DWDM line system that supports 50GHz or 100GHz spaced wavelengths per the ITU-T C-band grid thus offering complete and cost effective DWDM transport for IP, MPLS, and Ethernet applications. The module has a Gearbox to aggregate 10x10G signals into 4x25G/28Gbps data-streams. It has 4x LC duplex interfaces and offers 4x25/28Gbps DWDM optical signals (tunable 50GHz). These can be multiplexed into a Layer1 DWDM transmission system. It is designed with form factor, optical/electrical connection and digital diagnostic interface according to the CFP MSA Hardware Specification Revision 1.4.

## PRODUCT FEATURES

- Compliant with CFP MSA specification
- Quad full C-band 50GHz ITU-T transmitters
- 8xLC duplex connector
- 100GE CAUI or OTL-4.10 host interface
- Fully transparent 100GE and OTU4 transport, supports 103Gbps and 112Gbps aggregate
- Up to 20km transmission on SM fiber
- Receiver Decision Threshold Control (RDTC) for improved OSNR range with MDIO control
- Optical Duo Binary (ODB) modulation and pre-coding or compatibility with ROADMs
- Class 1 FDA and IEC60825-1 laser safety compliant
- MDIO interface with Digital Diagnostic Monitoring (DDM)
- RoHS6 compliant
- Power consumption <24W
- Operating temperature: -5°C to +70°C

## APPLICATIONS

- 100GBASE Ethernet links
- OTU-4

## ORDERING INFORMATION

Part Number	Description
SO-CFP-ER-DWDM	CFP, 103/112 Gbps, DWDM tuneable, SM, DDM, 20km

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## FUNCTIONAL DIAGRAM

This product converts the 10-channel 10Gbps electrical input data into 4 channel WDM optical signals, using a gearbox. The WDM light signals are combined by an optical MUX to a 103 or 112 Gbps data stream. The connector interface towards the SM fiber is LC. The receiver part accepts 103 or 112Gbps WDM optical signals and de-multiplexes them into 4 individual channels. Each wavelength is received by a photo diode (PIN) and converted into an electrical signal which is then converted into 10-channel 10Gbps electrical output data. Figure 1 shows the functional block diagram of this product.

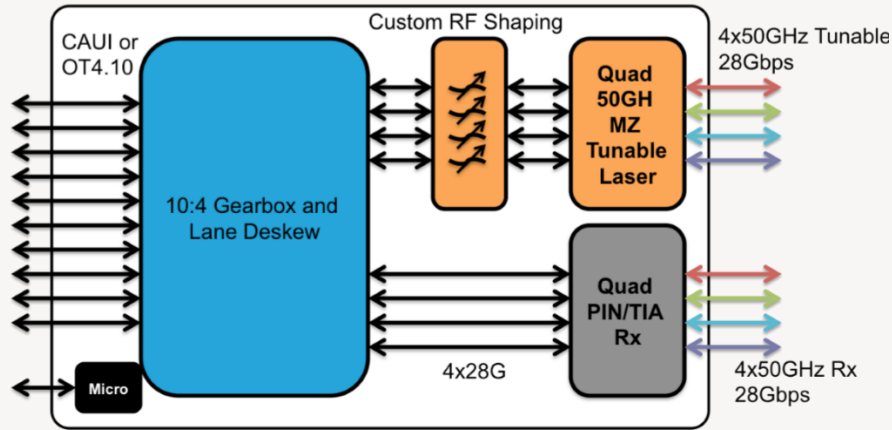


Figure 1. Functional diagram

## ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Storage Temperature	$T_s$	-40	+85	°C
Supply Voltage	$V_{cc}$	-0.5	3.6	V
Operating Relative Humidity	$RH$	5	85	%

## RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min	Typ	Max	Unit
Operating Case Temperature	$T_c$	-5		70	°C
Power Supply Voltage	$V_{cc}$	3.2	3.3	3.4	V
Power Consumption	P			24	W
Baud rate			103	112	Gbps
Link Distance (SM fiber)				20	km

## ELECTRICAL CHARACTERISTICS – TRANSMITTER &amp; RECEIVER (EACH LANE)

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Transmitter						
Input Amplitude (Differential)	$V_{in}$			1050	mVpp	AC coupled inputs
Differential Input Impedance	$Z_{in}$	80	100	120	Ohm	$R_{in} > 100k\Omega$ @ DC
Receiver						
Output Amplitude (Differential)	$V_{out}$	360		770	mVpp	AC coupled outputs
Differential Output Impedance	$Z_{out}$	80	100	120	Ohm	

## MDIO INTERFACE SPECIFICATION

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Input Voltage	$V_{IH}$	0.84		1.5	V	
	$V_{IL}$	-0.3		0.36	V	
Input Leak current	$I_{IN}$	-100		100	$\mu$ A	
Output Voltage	$V_{OH}$	1.0		1.5	V	
	$V_{OL}$	-0.3		0.2	V	
Input Capacitance	$C_i$			10	pF	
Input MDC Clock	$f_{MDC}$	0.1		4	MHz	
MDC Clock Period	$T_{MDC}$	250		10000	nsec	
MDIO Hold Time	$T_{hold}$	10			nsec	
MDIO Setup Time	$T_{setup}$	10			nsec	
GLB_ALM	$T_{glb\_alm\_ass}$					
	$T_{glb\_alm\_dea}$					

## OPTICAL CHARACTERISTICS – TRANSMITTER

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Host Native Nominal Bit Rate		10x 10.3125 (CAUI) & 4x 27.9525 (OTU4)			Gbps	
DWDM Line Interface Bit Rate		4x 25.78125 (4 Lane 100GE) & 4x 27.9525 (OTU4)			Gbps	
OTN Interface Bit Rate Deviation			$\pm 20$		ppm	
CAUI Interface Bit Rate Deviation			$\pm 100$		ppm	
DWDM Wavelength Range	$\lambda_{WDM}$	1528.38	-	1565.50	nm	
Channel Spacing	$f_{SPACING}$		50		GHz	
Laser Tuning Range	$f_{TUNE}$	Full C-band				
Wavelength Accuracy	$\Delta\lambda_{EOL}$	-25	-	+25	pm	
Per Lane Output Power	$P_{OUT}$	0	-	+2	dBm	
Output Power Flatness	$\Delta P_{AVG}$			1	dB	
Shutdown Optical Power	$P_{OFF}$			-35	dBm	
Side Mode Suppression Ratio	SMSR	35			dB	
Spectral Width @ -20dB	$\Delta\lambda$			0.35	nm	
Jitter Generation per Lane 50kHz to 200MHz	$J_{GEN}$			1.2	UIpp	

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## OPTICAL CHARACTERISTICS – RECEIVER (G.709 AND FEC PROVIDED BY HOST)

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Receive Wavelength Range	$\lambda_{WDM}$	1527	-	1566	nm	
Receiver Operating Range <sup>1,3,4</sup>						
± 400 ps/nm Dispersion	$P_{IN}$	-10	-	+1	dBm	
UFEC OSNR Requirement <sup>1,3,4</sup>		20	-	-	dB/	
±400 ps/nm Dispersion	$OSNR_{MIN}$				0.1nm	
-10dBm to +1dBm Input						
GFEC OSNR Requirement <sup>2,3,4</sup>		24	-	-	dB/	
±400 ps/nm Dispersion	$OSNR_{MIN}$				0.1nm	
-10dBm to +1dBm Input						

Note 1: PRBS 2<sup>23</sup>-1      Pre FEC BER = 3E-3,      Post FEC BER = <1E-12

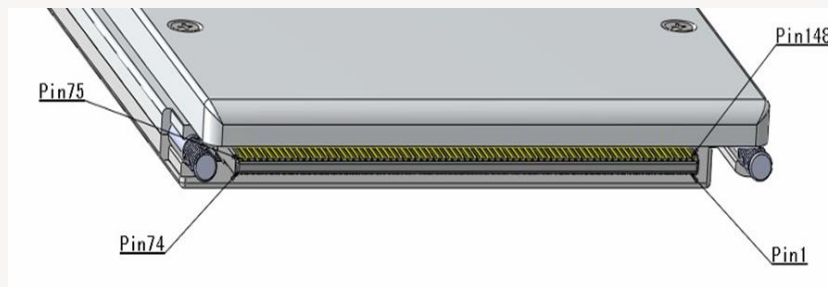
Note 2: PRBS 2<sup>23</sup>-1      , Pre FEC BER = 5E-5, Post FEC BER = <1E-12

Note 3: Optical filter with 35GHz -1dB bandwidth

Note 4: OSNR >30dB @ 0.1nm

## PIN ASSIGNMENT AND FUNCTION DEFINITIONS

### PIN ASSIGNMENT



### PIN DEFINITION

PIN	Signal Name	Description	PIN	Signal Name	Description
1	GND	3.3V Module Supply Ground	148	GND	3.3V Module Supply Ground
2	GND	3.3V Module Supply Ground	147	REFCLKn	Reference Clock Input
3	GND	3.3V Module Supply Ground	146	REFCLKp	Reference Clock Input
4	GND	3.3V Module Supply Ground	145	GND	3.3V Module Supply Ground
5	GND	3.3V Module Supply Ground	144	NC	Not Connected
6	3.3V	3.3V Module Supply Voltage	143	NC	Not Connected
7	3.3V	3.3V Module Supply Voltage	142	GND	3.3V Module Supply Ground
8	3.3V	3.3V Module Supply Voltage	141	TX9n	CML Input
9	3.3V	3.3V Module Supply Voltage	140	TX9p	CML Input
10	3.3V	3.3V Module Supply Voltage	139	GND	3.3V Module Supply Ground
11	3.3V	3.3V Module Supply Voltage	138	TX8n	CML Input

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12	3.3V	3.3V Module Supply Voltage	137	TX8p	CML Input
13	3.3V	3.3V Module Supply Voltage	136	GND	3.3V Module Supply Ground
14	3.3V	3.3V Module Supply Voltage	135	TX7n	CML Input
15	3.3V	3.3V Module Supply Voltage	134	TX7p	CML Input
16	GND	3.3V Module Supply Ground	133	GND	3.3V Module Supply Ground
17	GND	3.3V Module Supply Ground	132	TX6n	CML Input
18	GND	3.3V Module Supply Ground	131	TX6p	CML Input
19	GND	3.3V Module Supply Ground	130	GND	Ground (1)
20	GND	3.3V Module Supply Ground	129	TX5n	CML Input
21	VND_IO_A	Module Vendor I/O, NC	128	TX5p	CML Input
22	VND_IO_B	Module Vendor I/O, NC	127	GND	3.3V Module Supply Ground
23	GND	3.3V Module Supply Ground	126	TX4n	CML Input
24	(TX_MCLKn)	Tx Monitor Clock Output	125	TX4p	CML Input
25	(TX_MCLKp)	Tx Monitor Clock Output	124	GND	3.3V Module Supply Ground
26	GND	3.3V Module Supply Ground	123	TX3n	CML Input
27	VND_IO_C	Module Vendor I/O, must not connect at host board	122	TX3p	CML Input
28	VND_IO_D	Module Vendor I/O, must not connect at host board	121	GND	3.3V Module Supply Ground
29	VND_IO_E	Module Vendor I/O, must not connect at host board	120	TX2n	CML Input
30	PRG_CNTL1	Input LVCOMS	119	TX2p	CML Input
31	PRG_CNTL2	Input LVCOMS	118	GND	3.3V Module Supply Ground
32	PRG_CNTL3	Input LVCOMS	117	TX1n	CML Input
33	PRG_ALRM1	Output LVCOMS	116	TX1p	CML Input
34	PRG_ALRM2	Output LVCOMS	115	GND	3.3V Module Supply Ground
35	PRG_ALRM3	Output LVCOMS	114	TX0n	CML Input
36	TX_DIS	"1" or NC: transmitter disabled "0": transmitter enabled	113	TX0p	CML Input
37	MOD_LOPWR	"1" or NC: module is low power(safe) mode "0": power-on enabled	112	GND	3.3V Module Supply Ground
38	MOD_ABS	"1" or NC: module absent "0": module present	111	GND	3.3V Module Supply Ground
39	MOD_RSTn	"0": resets the module "1" or NC: module enabled	110	NC	Not Connected
40	RX_LOS	"1": low optical signal "0": normal condition	109	NC	Not Connected
41	GLB_ALRMn	Global Alarm "0": alarm condition in any MDIO Alarm register "1": no alarm condition	108	GND	3.3V Module Supply Ground
42	PRTADR4	1.2V CMOS Input, MDIO Physical port address bit 4	107	RX9n	CML Output
43	PRTADR3	1.2V CMOS Input, MDIO Physical port address bit 3	106	RX9p	CML Output
44	PRTADR2	1.2V CMOS Input, MDIO Physical port address bit 2	105	GND	3.3V Module Supply Ground
45	PRTADR1	1.2V CMOS Input, MDIO Physical port address bit 1	104	RX8n	CML Output
46	PRTADR0	1.2V CMOS Input, MDIO Physical port address bit 0	103	RX8p	CML Output
47	MDIO	1.2V CMOS I/O, Management Data I/O bi-directional data	102	GND	3.3V Module Supply Ground
48	MDC	1.2V CMOS Input, Management Data Clock	101	RX7n	CML Output
49	GND	3.3V Module Supply Ground	100	RX7p	CML Output

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50	VND_IO_F	Module Vendor I/O, Not Connected Internally	99	GND	3.3V Module Supply Ground
51	VND_IO_G	Module Vendor I/O, Not Connected Internally	98	RX6n	CML Output
52	GND	3.3V Module Supply Ground	97	RX6p	CML Output
53	VND_IO_H	Module Vendor I/O, Not Connected Internally	96	GND	3.3V Module Supply Ground
54	VND_IO_J	Module Vendor I/O, Not Connected Internally	95	RX5n	CML Output
55	GND	3.3V Module Supply Ground	94	RX5p	CML Output
56	GND	3.3V Module Supply Ground	93	GND	3.3V Module Supply Ground
57	GND	3.3V Module Supply Ground	92	RX4n	CML Output
58	GND	3.3V Module Supply Ground	91	RX4p	CML Output
59	GND	3.3V Module Supply Ground	90	GND	3.3V Module Supply Ground
60	3.3V	3.3V Module Supply Voltage	89	RX3n	CML Output
61	3.3V	3.3V Module Supply Voltage	88	RX3p	CML Output
62	3.3V	3.3V Module Supply Voltage	87	GND	3.3V Module Supply Ground
63	3.3V	3.3V Module Supply Voltage	86	RX2n	CML Output
64	3.3V	3.3V Module Supply Voltage	85	RX2p	CML Output
65	3.3V	3.3V Module Supply Voltage	84	GND	3.3V Module Supply Ground
66	3.3V	3.3V Module Supply Voltage	83	RX1n	CML Output
67	3.3V	3.3V Module Supply Voltage	82	RX1p	CML Output
68	3.3V	3.3V Module Supply Voltage	81	GND	3.3V Module Supply Ground
69	3.3V	3.3V Module Supply Voltage	80	RX0n	CML Output
70	GND	3.3V Module Supply Ground	79	RX0p	CML Output
71	GND	3.3V Module Supply Ground	78	GND	3.3V Module Supply Ground
72	GND	3.3V Module Supply Ground	77	(RX_MCLKn)	Rx Monitor Clock Output
73	GND	3.3V Module Supply Ground	76	(RX_MCLKp)	Rx Monitor Clock Output
74	GND	3.3V Module Supply Ground	75	GND	3.3V Module Supply Ground

## MECHANICAL DRAWING



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