

# 100GBASE-LR4 CFP 10kmOptical Transceiver NS-CFP-100G-LR4D

#### **Features**

- ◆ Operating optical data rate up to 112Gbps
- ◆ Transmission distance up to 10km
- ◆ CFP MSA compliant
- ◆ Compliant to 100GbE IEEE 802.3ba specification for 100GBASE-LR4 links
- ♦ OTU4 compatible
- ◆ 1310 nm window cooled EA-DFB LD and PIN ROSA
- Built in digital diagnostic function
- 10 parallel electrical serial interface and AC coupling of CML signals
- ◆ Hot pluggable electrical interface
- ♦ Low power dissipation<9W
- ◆ Operating case temperature 0°C to +70°C
   ◆ Single 3.3V power supply
- ◆ RoHS 6 compliant(lead free)

### **Applications**

♦ 100GbE IEEE 802.3ba 100GBASE-LR4

Центральный офис в Москве:

- ♦ OTN-OTU4
- ♦ Switch to switch interface or Switch to router interface

### **Description**

The 100GBASE-LR4 CFP module is the CFP optical transceiver which is a hot pluggable form factor designed for high speed optical networking application. The module is designed for 100Gigabit Ethernet application and provides 100GBASE-LR4 compliant optical interface, CAUI electrical interface and MDIO module managementinterface. The module converts 10-lane 10.3Gb/s electrical data streams to 4-lane LAN-WDM25.78Gb/s optical output signal and4-laneLAN-WDM25.78Gb/s optical inputsignal to 10-lane10.3Gb/s electrical data streams. This 10-lane 10.3Gb/s electrical signal is fully compliant with802.3ba CAUI specification and allows FR4 host PCB trace up to 25cm. The high performance Cooled LAN-WDM EML transmitter and high sensitivity PIN receiver provide superior performance for 100Gigabit.

Ethernet applications up to 10km links and compliant optical interface with IEEE802.3ba Clause 100GBASE-LR4 requirements.

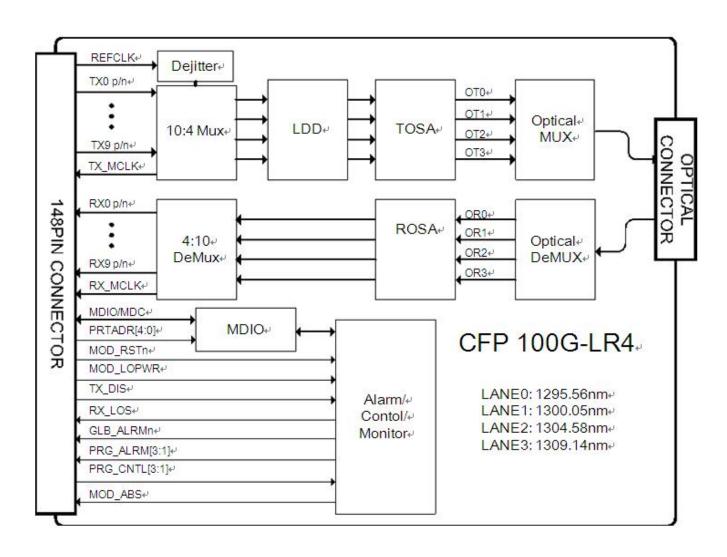


Филиал в Новосибирске

ИНН 7734380662 Юр. адрес: 123317, г. Москва, ул. Антонова-Овсеенко, д.15, стр.2

Тел: +7 (499) 346 00 00 E-mail: info@newnets.ru Тел: +7 (383) 376 66 75





### **Module Block Diagram**

# **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

ИНН 7734380662 Юр. адрес: 123317, г. Москва, ул. Антонова-Овсеенко, д.15, стр.2

Центральный офис в Москве:

Тел: +7 (499) 346 00 00

Филиал в Новосибирске E-mail: info@newnets.ru Тел: +7 (383) 376 66 75



Receiver Damage Threshold Per Lane	Pdag	dBm	+5.5	
------------------------------------	------	-----	------	--

# **Recommended Operating Conditions**

Parameter	Symbol	Unit	Min	Тур	Max
Operating Case Temperature Range	Tc	οС	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	Тур	Max	Notes				
	Voltage Sup	ply Elec	trical Charac	teristics						
Supply Current Tx Section / Rx Section A - 3 1										
December 1 Notes	M.				2%	DC-1MHz				
Power Supply Noise	Vrip				3%	1-10MHz				
Dissipation Class2	Pw	W			9					
Low Power Dissipation	Plow	W			2					
Inrush Current n 2	I-inrush mA	/usec			50					
Turn-off Current Class2	I-turnoff m <i>P</i>	√usec	-50							
	Different Sig	gnal Elec	trical Charac	teristics						
Single Ended Data Input S	wing	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					
	3.3V LVCM	OS Elect	rical Charact	eristics						
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 HighVoltage(IOH=100UA)	3.3VOH	V	Vcc-0.2 -		-					
Output Low Voltage	3.3VOL	V			0.2					

ИНН 7734380662 Юр. адрес: 123317, г. Москва, ул. Антонова-Овсеенко, д.15, стр.2

Центральный офис в Москве:

Тел: +7 (499) 346 00 00

E-mail: info@newnets.ru Тел: +7 (383) 376 66 75

Филиал в Новосибирске



(IOI = 100UA)								
Minimum Pulse Width of Control Pin Signal	T_CNTL	us	100					
1.2V LVCMOS Electrical Characteristics								
Input High Voltage	1.2VIH	V	0.84		1.5			
Input Low Voltage	1.2VIL	V	-0.3		0.36			

r				1						
Input Leakage Current	1.2IIN	uA	-100		+ 100					
Output HighVoltage	1.2VOH	V	1.0		1.5					
Output Low Voltage	1.2VOL	V	-0.3		0.2					
Output High Current	1.2IOH	mA	. 4		-4					
Output Low Current	1.2IOL	mA pF	+4		10					
Input Capacitance	Ci				10					
Optical Transmitter Characteristics										
Signaling Rate for Each				25.78125+/-						
Lane (100GbE)			-	100ppm						
Signaling Rate for Each		Gbps		27.95249+/-						
Lane (OTU4)				20ppm						
	入1		1294.53	1295.56	1296.59					
Four Lane Wavelength	入2		1299.02	1300.05	1301.09					
Range	入。		1303.54	1304.58	1305.63					
-	入4_	nm	1308.09	1309.14	1310.19					
Side Mode Suppression Ratio	SMSR	dB	30		-					
Total Average Launch Power (100GbE)			-		10.5					
Total Average Launch Power(OTU4)	Pt	dBm			8.9					
Average Launch Power for Each Lane(100GbE)	De	dD.m	-4.3		+4. 5	2				
Average Launch Power for Each Lane(OTU4)	Pa	dBm	-2.5		+2.9					
Optical Modulation Amplitude for Each Lane	OMA	dBm	-1.3		4.5	3				
Transmitter and Dispersion Penalty for Each Lanes(100GbE)		TDP			2.2					
Transmitter and Dispersion Penalty for Each Lanes(OTU4)		TDP			1.5					

ИНН 7734380662 Юр. адрес: 123317, г. Москва, ул. Антонова-Овсеенко, д.15, стр.2

Центральный офис в Москве:

Филиал в Новосибирске Тел: +7 (383) 376 66 75

Тел: +7 (499) 346 00 00 E-mail: info@newnets.ru



						_	
Average Launch Power of Off Transmitter for Each Lanes	Poff	dBm	-		-30		
Extinction Ratio (100GbE)	EX	dB	4				
Extinction Ratio (OTU4)	LΛ	QD.	7				
Maximum channel power difference		dB			5		
RIN20OMA		dB/Hz			-130		
Optical Return Loss Tolerance		dB			20		
Transmitter Reflectance		dB			-12	4	
Eye Diagram Compliant with IEEE 802.3ba-2010/G.959.1)							
	Optical	Receiver	Characterist	tics			
Receive Rate for Each				25.78125+/-			
Lane(100GbE)		Gbps		100ppm			
Receive Rate for		Obps		27.95249+/-			
EachLane(OTU4)				20ppm			
	入1		1294.53	1295.56	1296.59		
	入2		1299.02	1300.05	1301.09		
Four Lane Wavelength	入。	nm	1303.54	1304.58	1305.63		
Range	入		1308.09	1309.14	1310.19		
Overload Input Optical	Pmax	dBm	4.5			5	
Power	Tillax	GBIII	1.0				
Total Input Optical	Pt	dBm			8.9		
Power(OTU4)							
Average Receive Power for Each Lane(100GbE)	Pin	dBm	-10.6		4.5	6&7	
Average Receive Power for Each Lane(OTU4)		FIII   UDIII			2.9		
Receive Power In OMA for Each Lane	PinOMA	dBm	-		4.5		
Difference in Receive Power between Any Two		dBm	-		5.5		
Receiver Sensitivity in OMA for Each	Pmin	dBm			-8.6	8	
1	L1111(1	l abiii		I	l		

ИНН 7734380662 Юр. адрес: 123317, г. Москва, ул. Антонова-Овсеенко, д.15, стр.2

Центральный офис в Москве:

Тел: +7 (499) 346 00 00

Филиал в Новосибирске Тел: +7 (383) 376 66 75

E-mail: info@newnets.ru



Receiver Sensitivity for			-10.3	9
Each Lane(OTU4)			-10.5	9
StressedReceiver	dBm		-6.8	10&11
Sensitivity in OMA for Each	UDIII		-0.6	Ιυατι
Los Assert	dBm	-20	-15	

Los De-assert	dBm		-14	
Los Hysteresis	dBm	0.5		
Chromatic Dispersion	Ps/nm	-28.5	+9.5	
Maximum reflectance of optical network element	dB		-26	
Delay Group differencial	ps		8	

Note1. The supply current includes CFP module's supply current and test board working current.

Note2. Average launch power ,each lane(min) is informative and not the principal indicator of signal strength. A transmitter with launch power below this value cannot be compliant;

however, a value above this does not ensure compliance

Note3. Even if the TDP<1dB, the OMA(min) must exceed this value Note4.

Transmitter reflectance is defined looking into the transmitter

Note5. The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having this average power level

Note6. The average receive power, each lane (max) for 100GBASE-ER4 is larger than the 100BASE-ER4 transmitter value to allow compatibility with 100BASE-LR4 units at short distances

Note7. Average receive power, each lane (min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance Note8. Receiver sensitivity (OMA), each lane (max) is informative

Note9. Measured with PRBS 231-1 for BER=10-5. The BER for the OTU4 application is required to be met only after FEC has been applied.

Note10. Measured with conformance test signal at TP3 for BER=10-12 Note11. conditions of stressed receiver sensitivity test: vertical eye closure penalty for each lane is 1.8dB;stressed eye J2 jitter for each lane is 0.3UI; stressed eye J9 jitter for each lane is 0.47UI.

### **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	Н	L	Pull-up/down
------	--------	-------------	-----	-------	---	---	--------------

ИНН 7734380662 Юр. адрес: 123317, г. Москва, ул. Антонова-Овсеенко, д.15, стр.2

Центральный офис в Москве:

Тел: +7 (499) 346 00 00

E-mail: info@newnets.ru Тел: +7 (383) 376 66 75

Филиал в Новосибирске



30	PRG_CNTL1	Programmable Control 1 MSADefault: TRXIC_RST n, TX&RX ICs reset, "0 " :reset; "1"	I	3.3V LVCMOS	per CFP MSA Management Interface Specification		per CFP MSA		Pull-Up Note1
31	PRG_CNTL2	Programmable Control 2 MSADefault : Hardware Interlock LSB	-	3.3V LVCMOS			Pull-Up Note1		
32	PRG_CNTL3	Programmable Control 3 MSA Default:Hardware Interlock MSB	Ι	3.3V LVCMOS			Pull-Up Note1		
36	TX_DIS	Transmitter Disable	I	3.3V LVCMOS	Disable	Enable	Pull-Up Note1		
37	MOD_LOPW R	Module Low Power Mode	ı	3.3V LVCMOS	Low Power	Enable	Pull-Up Note1		
39	MOD_RSTn	Module Reset(Invert)	I	3.3V LVCMOS	Enable	Reset	Pull-Down Note2		

### **Hardware Alarm Pins**

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

Pin#	Symbol	Description	I/O	Logic	Н	L	Pull-up/down
33	prg_alrm1	Programmable Alarm 1 MSADefault:HIPWR_ON	0	3.3V LVCMOS	Active High per MDIO document		
34	PRG ALRM 2	Programmable Alarm 2MSA default:MOD_READY , Ready State has been reached	0	3.3V LVCMOS			
35	PRG ALRM3	Programmable Alarm 3 MSA Default: MOD FAULT	0	3.3V LVCMOS			
38	MOD_ABS	Module Absent	0	3.3V LVCMOS	Absent	Present	Pull-Down Note1
40	RX_LOS	Receiver Loss of Signal	0	3.3V LVCMOS	Loss of Signal	OK	

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

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

ИНН 7734380662 Юр. адрес: 123317, г. Москва, ул. Антонова-Овсеенко, д.15, стр.2

Центральный офис в Москве:

Тел: +7 (499) 346 00 00

E-mail: info@newnets.ru

Филиал в Новосибирске Тел: +7 (383) 376 66 75



# **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	Н	L	Pull-up/down
41	GLB_ALRMn	Global Alarm	I	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	•	MDIO nent[5]	
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	İ	1.2V LVCMOS			
42	PRTADR4	MDIO Physical Port address bit4	İ	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_a ssert		1	ms	Application Specific May depend on current state Condition when signal is applied .See
TX Disable Assert Time	T_off		100	us	

# **High Speed Electrical Characteristics**

Reference Clock Characteristics

		Min	Тур	Max	Unit	Notes
Impedance	Zd	80	100	120	Q	
Frequency			161.1328125/644.53125		MHz	1/64 or 1/16 of electrical lane rate
Frequency Stability	Δf	-100		100	ppm ·	For Ethernet applications
		-20		20		For Telecom applications

ИНН 7734380662 Юр. адрес: 123317, г. Москва, ул. Антонова-Овсеенко, д.15, стр.2

Центральный офис в Москве:

Тел: +7 (499) 346 00 00

Филиал в Новосибирске E-mail: info@newnets.ru Тел: +7 (383) 376 66 75

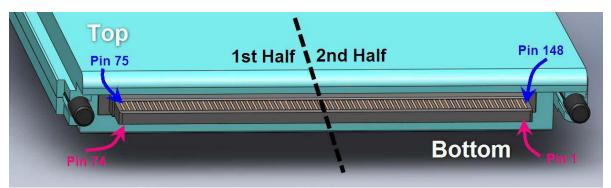


Output Differential Voltage	VDIFF	400	1200	mV	Peak to Peak Differential
RMS jitter1-2	0		10	ps	Random Jitter Over frequency band of 10KHz <f<10mhz< td=""></f<10mhz<>
Clock Duty Cycle		40	60	%	
Clock Rise/Fall	t /£	200	1250		1/64 of electrical lane rate
Time 10%/90%	50	315	ps	1/16 of electrical lane rate	

Note1: The term "40GBASE\_FR" is the 40GbE serial optical interface in the task force phase at IEEE-SA at the time of this publication. Also, 1/16 of optical lane clock is recommended for TX\_MCLK and RX\_MCLK Note2: Multi-protocol modules are recommended to adopt the clock rate rate used in Telecom applications

Optional Transmitter and Receiver Monitor Clock Characteristics

		Min	Тур	Max	Unit	Notes
Impedance	Zd	80	100	120	Q	
Frequency					MHz	1/8 of Network lane rate
Output Differential Voltage	VDI FF	400		1200	mV	Peak to Peak Differential
Clock Duty Cycle		40		60	%	

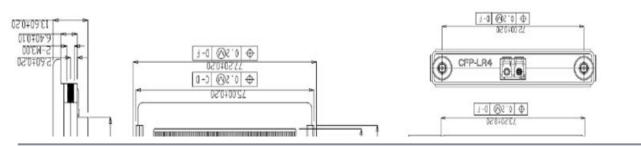


Pad Layout of the CFP module

# **CFP Optical Interface lanes and Assignment**

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

### **Mechanical Dimensions**



ИНН 7734380662 Юр. адрес: 123317, г. Москва, ул. Антонова-Овсеенко, д.15, стр.2

Центральный офис в Москве:

Тел: +7 (499) 346 00 00 E-mail: info@newnets.ru

Филиал в Новосибирске Тел: +7 (383) 376 66 75



Unit: mm

# **Mechanical Specifications**

# **Ordering information**

Part Number		Product Description					
	NS-CFP-100G-LR4D	CFP, 100GE/OTU4,10km,100GBASE-LR4, Pout -4.3 ~ +4.5 PIN <-8.6dBm					

1.100G Ethernet

2.100G OTU4

### **Standards**

Compliant with IEEE 802.3ba
Compliant with CFP MSA hardware specification
Compliant with CFP MSA management specification
Compliant with ITU-T G.709/Y.1331 Compliant with RoHS&WEEE

ИНН 7734380662 Юр. адрес: 123317, г. Москва, ул. Антонова-Овсеенко, д.15, стр.2

Центральный офис в Москве: Тел: +7 (499) 346 00 00 Филиал в Новосибирске E-mail: info@newnets.ru Тел: +7 (383) 376 66 75