Preliminary DATA SHEET

CFORTH-XENPAK-10GB-ER

10GBASE-ER XENPAK Transceiver, 1550nm, SC Connectors, 40km over Single-Mode Fiber

CFORTH-XENPAK-10GB-EROverview

CFORTH-XENPAK-10GB-ER 10GBd XENPAK optical transceivers are designed for Storage, IP network and LAN, it is a hot pluggable module in the Z-direction that is mainly usable in typical router/switches line card applications. The CFORTH-XENPAK-10GB-ER is a fully integrated 10.3 Gb/s optical transceiver module that consists of a 1550nm wavelength optical transmitter and receiver, XAUI interface, Mux and Demux with clock and data recovery (CDR). In addition, they comply with the XENPAK Multi Sourcing Agreement (MSA).

Product Features

- Up to 10 GBd bi-directional data links.
- Compliant with IEEE 802.3ae, 10GBASE-ER application.
- Compliant with XENPAK MSA.
- Temperature stabilized EML transmitter.
- PIN Photo-detector.
- XAUI electrical interface: 4 lanes @ 3.125 GBd.
- MDIO, DOM (Digital Optics Monitoring) support.
- Hot Z-Pluggable.
- SC Connectors
- Up to 40km on SMF
- Power Supply: 5V/3.3V/Adaptable Power Supply (APS: 1.2V)
- RoHS Compliance
- Operating temperature range: 0℃ to 70℃.

Applications

- 10 GBd Ethernet

Ordering Information

Part Number	*Description*
CFORTH-XENPAK-10GB-ER	10GBASE-ER XENPAK Transceiver, SC Connectors, 1550nm, Single Mode Fiber 40km

Absolute Maximum Ratings

Parameter	*Symbol*	*Min*	*Typ*	*Max*	*Unit*	*Remarks*
Storage Ambient Temperature	T_S	– 40		85	℃	
Supply Voltage (5V)	V_5	0		6	V	
Supply Voltage (3.3V)	V_3	0		4	V	
Supply Voltage (APS)	V_{APS}	0		1.5	V	
Optical Receiver Input	P_{IMAX}			1.5	dBm	Average

General Specifications

Parameter	*Symbol*	*Min*	*Typ*	*Max*	*Unit*	*Remarks*
Data Rate	*DR*		10.3125		GBd	
Bit Error Rate	*BER*			10^{-12}		
Total Power Consumption	*P*			4	W	
Supply Voltage (5V)	V_{CC5}	4.75	5	5.25	V	Operating Environment
Supply Voltage (+3.3V)	V_{CC3}	3.14	3.3	3.47	V	Operating Environment
Supply Voltage (APS)	V_{CCAPS}	1.152	1.2	1.248	V	Operating Environment
Supply Current (5V)	I_{CC5}			350	mA	
Supply Current (+3.3V)	I_{CC3}			300	mA	
Supply Current (APS)	I_{CCAPS}			1000	mA	
Case Operating Temperature	T_C	0		70	℃	

Link Distances

Parameter	*Fiber Type*	*Distance Range (Km)*
10.3125GBd	9/125um SMF	40

Optical Characteristics - Transmitter

V_{CC5}=4.75V to 5.25V, V_{CC3}=3.14V to 3.47V, V_{CCAPS}=1.152V to 1.248V, T_C=0℃ to 70℃

Parameter	*Symbol*	*Min*	*Typ*	*Max*	*Unit*	*Remarks*
Optical Wavelength	λ	1530		1570	nm	
Launch Power	P_{OUT}	– 4.7		4.0	dBm	Average
Launch Power of OFF Transmitter	P_{OUT_OFF}			– 30	dBm	Average
Side Mode Suppression Ratio	*SMSR*	30			dB	
Spectral Width (– 20 dB)	$\Delta\lambda$			0.6	nm	
Optical Extinction Ratio	*ER*	8.2			dB	
Optical Return Loss Tolerance	ORL_T			12	dB	
Relative Intensity Noise	*RIN*			– 128	dB/Hz	
Transmitter Dispersion Penalty	*TDP*			2	dB	
Eye Mask Definition		According to IEEE 802.3ae				

Optical Characteristics - Receiver

V_{CC5}=4.75V to 5.25V, V_{CC3}=3.14V to 3.47V, V_{CCAPS}=1.152V to 1.248V, T_C=0℃ to 70℃

Parameter	*Symbol*	*Min*	*Typ*	*Max*	*Unit*	*Remarks*
Center Wavelength Range	λ_C	1260		1600	nm	
Optical Input Power	P_{IN}	– 15.8		– 1.0	dBm	Average, Informative
Receiver Sensitivity in OMA	P_{IN_OMA}			– 14.1	dBm	Informative
Stressed Receiver Sensitivity	P_{IN_S}			– 11.3	dBm	
Receive Reflectance	TR_{RX}			– 27	dB	
Loss of Signal Assert Level	P_{LOS_A}	– 25			dBm	
Loss of Signal DeAssert Level	P_{LOS_D}			– 17	dBm	
Loss of Signal Hysteresis	P_{LOS_H}	1			dBm	
Receiver electrical 3dB upper cutoff frequency	*FR*			12.3	GHz	

Electrical Characteristics - DC

V_{CC5}=4.75V to 5.25V, V_{CC3}=3.14V to 3.47V, V_{CCAPS}=1.152V to 1.248V, T_C=0℃ to 70℃

Parameter	*Symbol*	*Min*	*Typ*	*Max*	*Unit*	*Remarks*
A.						
1.2V COMS I/O DC Characteristics (PRTAD; LASI; RESET; TX_ON/OFF)						
External Pull-Up Resistor For Open Drain	R_{PU}	10		22	kΩ	
Output High Voltage	V_{OH}	1			V	
Output Low Voltage	V_{OL}			0.15	V	
Input High Voltage	V_{IH}	0.84		1.2	V	
Input Low Voltage	V_{IL}			0.36	V	
Input Pull-Down Current	I_{PD}	20		120	uA	V_{IN}=1.2V
B.						
XAUI I/O DC Charateristics (TXLANE[0..3]; RXLANE[0..3])						
Differential Input Amplitude (pk – pk)	V_{IN_XAUI}	200		2500	mV	AC Coupled
Differential Output Amplitude (pk – pk)	V_{OUT_XAUI}	800		1600	mV	AC Coupled
C.						
MDIO I/O DC Charateristics (MDIO; MDC)						
Output Low Voltage	V_{OL}			0.2	V	I_{OL}=100uA
Output Low Current	I_{OL}			4	mA	
Input High Voltage	V_{IH}	0.84		1.2	V	
Input Low Voltage	V_{IL}			0.36	V	
Pull-Up Supply Voltage	V_{PU}	1.152	1.2	1.248	V	
Input Capacitance	C_{IN}			10	pF	
Load Capacitance	C_{LOAD}			470	pF	
External Pull-Up Resistance	R_{PU}	200			Ω	

Electrical Characteristics - AC

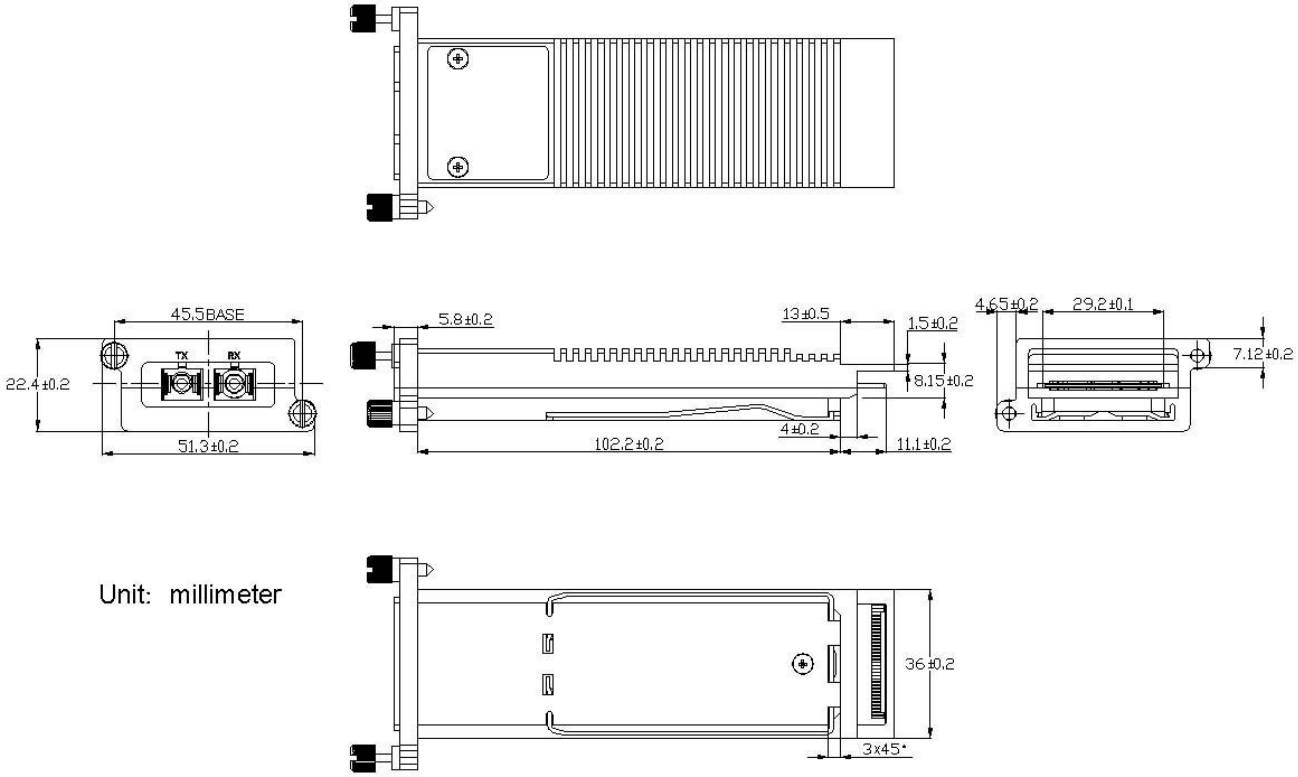
V_{CC5}=4.75V to 5.25V, V_{CC3}=3.14V to 3.47V, V_{CCAPS}=1.152V to 1.248V, T_C=0℃ to 70℃

Parameter	*Symbol*	*Min*	*Typ*	*Max*	*Unit*	*Remarks*
A.						
XAUI Input AC Characteristics (TXLANE[0..3])						
Baud Rate	BR_{XAUI_IN}		3.125		GBd	
Baud Rate Tolerance	BR_{TOL_XAUI}	– 100		100	ppm	
Differential Input Impedance	Z_{IN_XAUI}	80	100	120	Ω	
Differential Return Loss	RL_{IN}	10			dB	100 MHz to 2.5 GHz
Input Differential Skew	T_{IN_SKEW}			75	ps	Crossing Point
Jitter Amplitude Tolerance	J_{XAUI_TOL}			0.65	UI_{PP}	IEEE 802.3ae
B.						
XAUI Output AC Characteristics (RXLANE[0..3])						
Baud Rate	BR_{XAUI_OUT}		3.125		GBd	
Baud Rate Variation	BR_{XAUI_VAR}	– 100		100	ppm	
XAUI Eye Mask (far-end)	According to IEEE 802.3ae					
Output Differential Skew	T_{OUT_SKEW}			15	ps	
Output Differential Impedance	Z_{OUT_XAUI}	80	100	120	Ω	
Differential Output Return Loss	RL_{OUT}	10			dB	100 MHz to 2.5 GHz
Total Jitter	TJ_{XAUI}			0.35	UI	Near-end No pre-equalization
Deterministic Jitter	DJ_{XAUI}			0.17	UI	1 UI=320 ps
C.						
Power-On Reset Characteristics						
Power-On Reset and TX_ONOFF Characteristics	According to XENPAK MSA Issue					
D.						
MDIO I/O AC Characteristics (MDIO; MDC)						
MDIO Data Hold Time	T_{HOLD}	10			ns	
MDIO Data Setup Time	T_{SU}	10			ns	
Delay from MDC Rising Edge to MDIO Data Change	T_{DELAY}			300	ns	
MDC Clock Rate	f_{MAX}			2.5	MHz	

Digital Diagnostic

Parameter	*Symbol*	*Min*	*Typ*	*Max*	*Unit*	*Remarks*
Temperature Monitor	T_{MON}	-5		+5	℃	
Laser Bias Monitor	I_{MON}	-10		10	%	
TX Power Monitor	P_{TX}	-3		+3	dBm	
RX Power Monitor	P_{RX}	-3		+3	dBm	

Dimensions



Unit: millimeter

ALL DIMENSIONS ARE ±0.2mm UNLESS OTHERWISE SPECIFIED

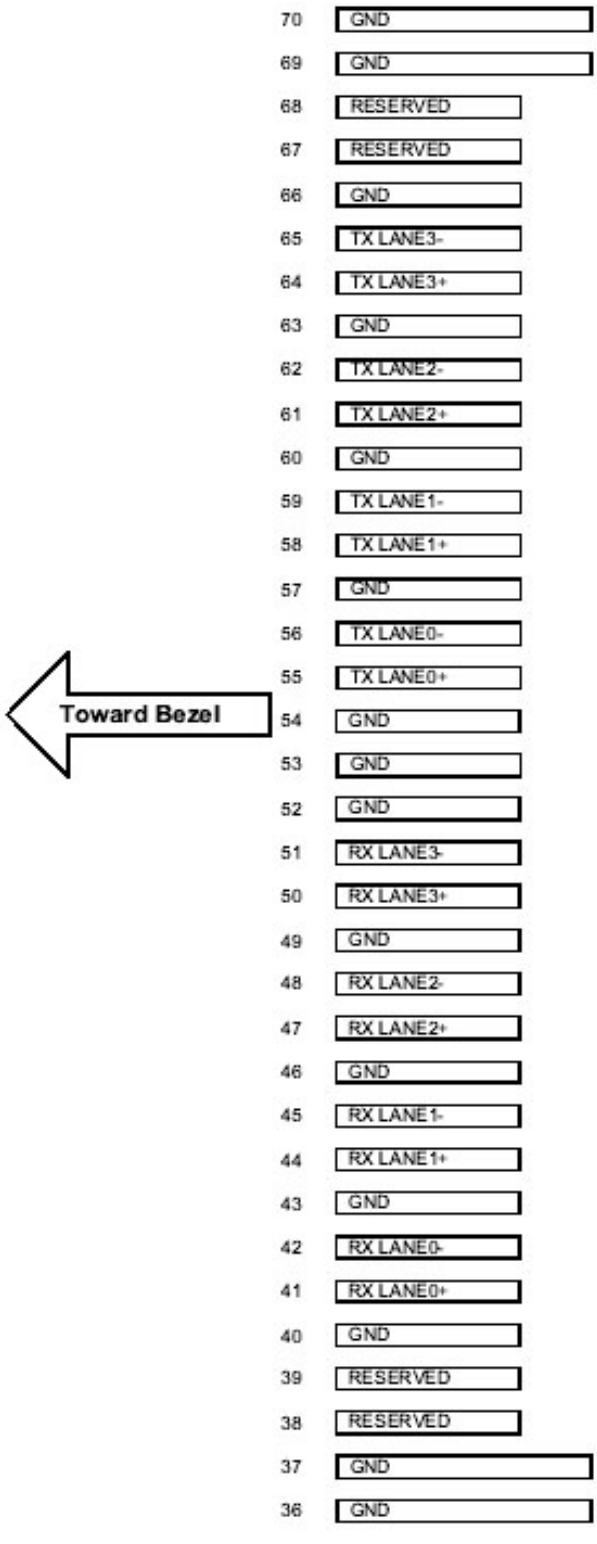
Pin Assignment – Pin 1 to Pin 35

PIN #	*Symbol*	*I/O*	*Logic*	*Description*	*PIN #*
1	GND		Supply	Electrical ground	1
2	GND		Supply	Electrical ground	2
3	GND		Supply	Electrical ground	3
4	5.0V		Supply	Power	4
5	3.3V		Supply	Power	5
6	3.3V		Supply	Power	6
7	APS		Supply	Adaptive Power Supply	7
8	APS		Supply	Adaptive Power Supply	8
9	LASI		Open Drain	Link Alarm Status Interrupt. 10-22k ohm pull up on host	9
10	RESET	I	1.2V CMOS	TX OFF when MDIO RESET	10
11	VEND SPECIFIC			Vendor Specific Pin. Leave unconnected	11
12	TX ON/OFF	I	1.2V CMOS	Transmitter ON/OFF	12
13	RESERVED			Reserved	13
14	MOD DETECT	O		Pulled low inside module through 1k ohm	14
15	VEND SPECIFIC			Vendor Specific Pin. Leave unconnected	15
16	VEND SPECIFIC			Vendor Specific Pin. Leave unconnected	16
17	MDIO	I/O	Open Drain	Management Data IO	17
18	MDC	I	1.2V CMOS	Management Data Clock	18
19	PRTAD4	I	1.2V CMOS	Port Address bit 4 (Low=0)	19
20	PRTAD3	I	1.2V CMOS	Port Address bit 3 (Low=0)	20
21	PRTAD2	I	1.2V CMOS	Port Address bit 2 (Low=0)	21
22	PRTAD1	I	1.2V CMOS	Port Address bit 1 (Low=0)	22
23	PRTAD0	I	1.2V CMOS	Port Address bit 0 (Low=0)	23
24	VEND SPECIFIC			Vendor Specific Pin. Leave unconnected	24
25	APS SET			Feedback output for APS	25
26	RESERVED			Reserved for Avalanche Photodiode use	26
27	APS SENSE		Analog	APS Sense Connection	27
28	APS		Supply	Adaptive Power Supply	28
29	APS		Supply	Adaptive Power Supply	29
30	3.3V		Supply	Power	30
31	3.3V		Supply	Power	31
32	5.0V		Supply	Power	32
33	GND		Supply	Electrical Ground	33
34	GND		Supply	Electrical Ground	34
35	GND		Supply	Electrical Ground	35

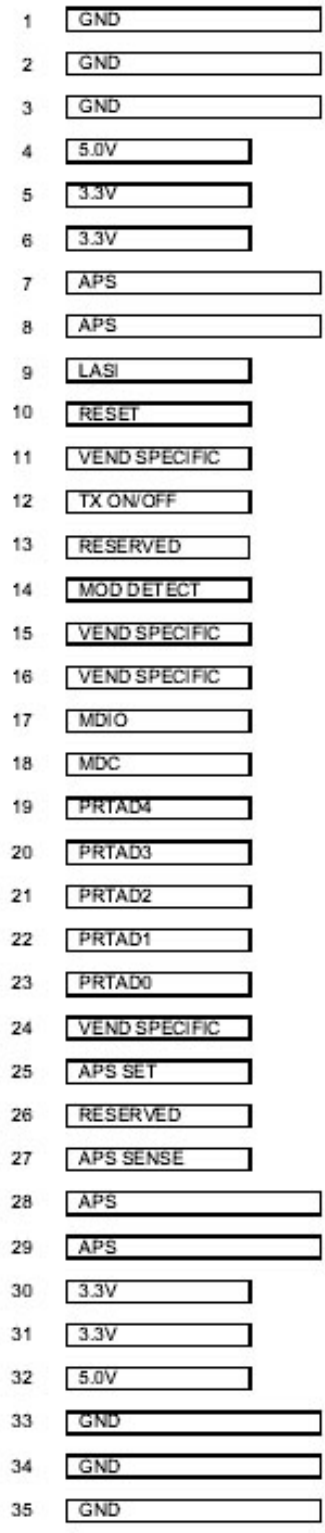
Pin Assignment – Pin 36 to Pin 70

PIN #	*Symbol*	*I/O*	*Logic*	*Description*	*Remarks*
36	GND		Supply	Electrical ground	
37	GND		Supply	Electrical ground	
38	RESERVED			Reserved	
39	RESERVED			Reserved	
40	GND		Supply	Electrical ground	
41	RX LANE 0+	O	AC	Module XAUI Output Lane 0+	
42	RX LANE 0–	O	AC	Module XAUI Output Lane 0–	
43	GND		Supply	Electrical ground	
44	RX LANE 1+	O	AC	Module XAUI Output Lane 1+	
45	RX LANE 1–	O	AC	Module XAUI Output Lane 1–	
46	GND		Supply	Electrical ground	
47	RX LANE 2+	O	AC	Module XAUI Output Lane 2+	
48	RX LANE 2–	O	AC	Module XAUI Output Lane 2–	
49	GND		Supply	Electrical ground	
50	RX LANE 3+	O	AC	Module XAUI Output Lane 3+	
51	RX LANE 3–	O	AC	Module XAUI Output Lane 3–	
52	GND		Supply	Electrical ground	
53	GND		Supply	Electrical ground	
54	GND		Supply	Electrical ground	
55	TX LANE 0+	I	AC	Module XAUI Input Lane 0+	
56	TX LANE 0–	I	AC	Module XAUI Input Lane 0–	
57	GND		Supply	Electrical ground	
58	TX LANE 1+	I	AC	Module XAUI Input Lane 1+	
59	TX LANE 1–	I	AC	Module XAUI Input Lane 1–	
60	GND		Supply	Electrical ground	
61	TX LANE 2+	I	AC	Module XAUI Input Lane 2+	
62	TX LANE 2–	I	AC	Module XAUI Input Lane 2–	
63	GND		Supply	Electrical ground	
64	TX LANE 3+	I	AC	Module XAUI Input Lane 3+	
65	TX LANE 3–	I	AC	Module XAUI Input Lane 3–	
66	GND		Supply	Electrical ground	
67	RESERVED			Reserved	
68	RESERVED			Reserved	
69	GND		Supply	Electrical Ground	
70	GND		Supply	Electrical Ground	

Electrical Pad Layout



Top of Transceiver PCB



Bottom of Transceiver PCB
As viewed through top

References

1. IEEE standard 802.3. IEEE Standard Department, 2005., 10GBASE-ER

2. XENPAK Multi-Source Agreement (MSA).