10G Small Form Pluggable (X2) Optical Transceivers

OptixCom
Connect with Light

Features

- 850 nm, 1310 nm, 1550 nm, CWDM, DWDM
- 9.95 – 11.3 Gb/s, up to 80 km
- X2 MSA and IEEE 802.3ae 10GBASE compliant
- Duplex SC optical connector
- 70-pin connector z-axis hot pluggable
- Standard 4-channel XAUI interface

XFP

Applications

- ✓ 10 Gigabit Ethernet, 10G Fiber Channel
- ✓ SONET OC-192/SDH STM-64
- ✓ CWDM and ITU-T G.709 DWDM networks
- ✓ Data Communication for SAN and LAN
- ✓ Mass storage systems interconnect
- ✓ Routers and switches, computer cluster cross-connect

Products Selection Guide

Part Number *	Wavelength	Data Rate	Power Budget	Distance**	Temp. Range
850 nm, Multimode Applications					
X2-10000SX-AT300M	850 nm	10Gb/s	>4 dB	300 m	0 – 70°C
1310 nm, Single Mode Applications					
X2-10000LX-AT10K	1310 nm	10 Gb/s	>4dB	10 km	0 – 70°C
1550 nm, Single Mode Applications, 40 – 80 km					
X2-10000EX-AT40K	1550 nm	10 Gb/s	>15dB	40 km	0 – 70°C
X2-10000EX-AT80K	1550 nm	10 Gb/s	>24 dB	80 km	0 – 70°C
CWDM & DWDM Applications, 40 – 80 km					
X2-10000CEX-AT40K-XX	1470 -1610 nm	10 Gb/s	>15dB	40 km	0 – 70°C
X2-10000CEX-AT80K-XX	1470 -1610 nm	10 Gb/s	>24 dB	80 km	0 – 70°C
X2-10000DEX-AT40K-XX	ITU 17 – 61	10 Gb/s	>15 dB	40 km	0 – 70°C
X2-10000DEX-AT80K-XX	ITU 17 - 59	10 Gb/s	>24 dB	80 km	0 – 70°C

*: XX indicates wavelength selection for the 1270 – 1610 nm C/DWDM transceivers. See data sheet for details.

**: The indicated distance is for reference only, not guaranteed specifications. The actual transmission distance depends on system configuration and power budget. For single mode fibers, the typical loss is 0.25 dB/km @ 1550 nm and 0.35 dB/km @ 1310 nm.

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http://www.OptixCom.com
http://www.OpticalTransceiver.com

Description

OptixCom's X2 fiber optics transceiver is designed with advanced 850 nm VCSEL and high speed electronics to achieve the optimum performance for optical interconnect applications. It is compliant with the X2 Multi-Source Agreement (MSA).

X2 uses the same 70-pin electrical connector as XENPAK and supports implementations of XENPAK's four lane XAUI (10 Gigabit attachment unit interface) at both Ethernet (3.125 Gb/sec) and/or Fiber Channel (3.1875 Gb/sec) rates.

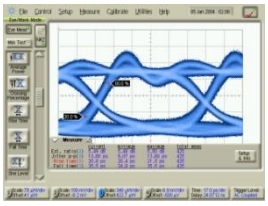
The transceiver uses duplex SC connector for the optical interface and is hot pluggable in the z-axis. The transceiver has 4-9 dB of power budget and reaches up to 300 meters of transmission distance with OM3 multimode fibers. The product is RoHS compliant. Total power consumption is < 2.4W.

Lead-Free

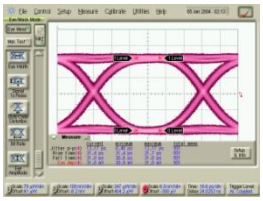
X2-10000SX-AT300M

10 Gb/s, 2^{31}-1 NRZ data eye pattern

TX



RX



Key Features

- Standard XAUI interface with 3Gb/s per channel
- 850 nm multimode, 300 m, 10 Gb/s data rate
- >4 dB power budget
- Duplex SC connector optical interface
- 70-pin Z-axis hot pluggable connector
- AC coupling CML differential I/O logics
- Compliant with X2 MSA standard
- Compliant with IEEE 802.3ae, 10GBASE-SW/SR
- Compliant with 10G FC Fiber Channel Standard
- RoHS compliant

Ordering Information

Part Number: X2-10000SX-AT300M

Description:

850 nm 10 Gb/s, multimode, X2 fiber optics transceiver, 300 m reach, 0-70°C

Applications

- ✓ 10G Fiber Channel & Ethernet
- ✓ OC192/STM-64 for SONET/SDH
- ✓ High speed I/O for file server
- ✓ Data Communication for SAN and LAN
- ✓ Central offices routers and switches
- ✓ Mass storage systems interconnect
- ✓ Computer cluster cross-connect

Operating Conditions

Parameter	Min.	Typical	Max.	Units
Operate Temperature	0	25	70	°C
Data Rate	9.95	---	11.3	Gb/s
Adaptable Power Supply	1.15	1.2	1.25	V
Power Supply Vcc	3.1	3.3	3.5	V
Power Dissipation	---	1.7	2.4	W

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Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Units
Storage Temperature	*Tst*	-40	85	°C
Adaptable Power Supply (APS)	*Vaps*	0	1.5	V
Supply Voltage @ 3.3V	*Vcc*	-0.5	4.0	V
Humidity	*R.H.*	0	85	%

Typical Transmission Distance for Multimode Fibers @ 850 nm

Data Rate	Fiber Type	Distance (m)	Data Rate	Fiber Type	Distance (m)
1.25 Gb/s	50 µm, 500 MHz*km	550	10 Gb/s	50 µm, 2000 MHz*km	300
	50 µm, 400 MHz*km	500		50 µm, 500 MHz*km	82
	62.5 µm, 200 MHz*km	275		62.5 µm, 200 MHz*km	33
	62.5 µm, 160 MHz*km	220		62.5 µm, 160 MHz*km	26

Transmitter Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
XAUI Data Rate	*XDR*	---	3.125	---	Gb/s
XAUI Baud Rate Tolerance	*XBRT*	-100	---	+100	ppm
Differential Input Voltage [1]	*ΔVi*	0.2	---	1.6	V
Differential Input Impedance [2]	*Z*	---	100	---	ohm
Optical Output Power [3]	*Po*	-6.5	---	-1	dBm
Transmitter & Dispersion Penalty	*TDP*	---	---	3.2	dB
Optical Wavelength	*λo*	840	850	860	nm
Optical Modulation Amplitude	*OMA*	525	---	---	µW
Extinction Ratio	*ET*	3.5	---	---	dB
Spectral Width (rms)	*Δλ*	---	0.4	0.45	dB
Total Output Jitter	*TOJ*	---	---	0.35	UI
Total Deterministic Output Jitter	*TDJ*	---	---	0.17	UI

Notes:

1. Module is designed for AC coupling. DC voltage will be filtered by internal capacitors.
2. Single ended will be 50 ohm for each signal line.
3. Output of coupling optical power into 50/125 µm MMF.
4. Refer to OptixCom "X2 Design Reference Guide" or IEEE 802.3ae for more design details.

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Receiver Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Operating Wavelength	λ_C	840	---	860	nm
Receiver Sensitivity [1]	P_I	-9.9	---	-1.0	dBm
Receiver Sensitivity in OMA [1]	P_{IOMA}	---	---	-11.1	dBm
RX Stressed Sensitivity in OMA [1]	P_{SOMA}	---	---	-7.5	dBm
Differential Output Voltage	ΔV_O	0.8	---	1.6	V
Differential Input Impedance [2]	Z	---	100	---	Ohm

Notes:

1. Test at 10 Gb/s, 2^{31} – 1 PRBS data pattern, and > $1x10^{-12}$ of Bit-Error-Rate (BER).
2. Single ended will be 50 ohm for each signal line.
3. Refer to OptixCom "X2 Design Reference Guide" or IEEE 802.3ae for more design details.

Electrical Signal Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
1.2 V CMOS					
Input High Voltage	$V_{IL(MAX)}$	---	---	0.36	V
Input Low Voltage	$V_{IH(MIN)}$	0.84	---	1.25	V
Capacitance		---	---	320	pF
Pull Up Resistance	R_{pull}	10k	---	22k	Ohm
MDIO I/O					
Output Low Voltage	V_{OL}	-0.3	---	0.2	V
Output Low Current	I_{OL}	---	---	4	mA
Input High Voltage	V_{IH}	0.84	---	1.5	V
Input Low Voltage	V_{IL}	-0.3	---	0.36	V
Pull-Up Supply Voltage	V_{PULL}	1.14	1.2	1.26	
Input Capacitance	C_{IN}	---	---	10	pF
Load Capacitance	C_{LOD}	---	---	470	pF
External Pull-Up Resistance	E_{pull}	200	---	---	Ohm

Class 1 Laser Product
Complies with
21 CFR 1040.10 and 1040.11

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Description

OptixCom's X2 fiber optics transceiver is designed with advanced 1310 nm DFB laser and high speed electronics to achieve the optimum performance for optical interconnect applications. It is compliant with the X2 Multi-Source Agreement (MSA).

X2 uses the same 70-pin electrical connector as XENPAK and supports implementations of XENPAK's four lane XAUI (10 Gigabit attachment unit interface) at both Ethernet (3.125 Gb/sec) and/or Fiber Channel (3.1875 Gb/sec) rates.

The transceiver uses duplex SC connector for the optical interface and is hot pluggable in the z-axis. The transceiver has 4-13 dB of power budget and reaches up to 10 km of transmission distance with single mode fibers. The product is RoHS compliant. Total power consumption is < 4W.

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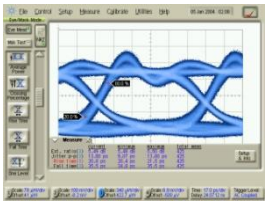
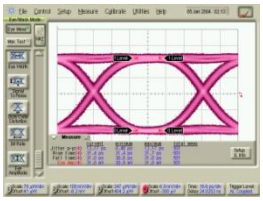
X2-10000LX-AT10K

10 Gb/s, 2^{31}-1 NRZ data eye pattern

TX



RX



Key Features

- Standard XAUI interface with 3Gb/s per channel
- 1310 nm single mode, 10 km, 10 Gb/s data rate
- >4 dB power budget
- Duplex SC connector optical interface
- 70-pin Z-axis hot pluggable connector
- AC coupling CML differential I/O logics
- Compliant with X2 MSA standard
- Compliant with IEEE 802.3ae, 10GBASE-LW/LR
- Compliant with 10G FC Fiber Channel Standard
- RoHS compliant

Ordering Information

Part Number: X2-10000LX-AT10K

Description:

1310 nm 10 Gb/s, single mode, X2 fiber optics transceiver, 10 km reach, 0-70°C

Applications

- ✓ 10G Fiber Channel & Ethernet
- ✓ OC192/STM-64 for SONET/SDH
- ✓ High speed I/O for file server
- ✓ Data Communication for SAN and LAN
- ✓ Central offices routers and switches
- ✓ Mass storage systems interconnect
- ✓ Computer cluster cross-connect

Operating Conditions

Parameter	Min.	Typical	Max.	Units
Operate Temperature	0	25	70	°C
Data Rate	9.95	---	11.3	Gb/s
Adaptable Power Supply	1.15	1.2	1.25	V
Power Supply Vcc	3.1	3.3	3.5	V
Power Dissipation	---	3.5	4	W

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Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Units
Storage Temperature	*Tst*	-40	85	°C
Adaptable Power Supply (APS)	*Vaps*	0	1.5	V
Supply Voltage @ 3.3V	*Vcc*	-0.5	4.0	V
Humidity	*R.H.*	0	85	%

Transmitter Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
XAUI Data Rate	*XDR*	---	3.125	---	Gb/s
XAUI Baud Rate Tolerance	*XBRT*	-100	---	+100	ppm
Differential Input Voltage [1]	*ΔVi*	0.2	---	1.6	V
Differential Input Impedance [2]	*Z*	---	100	---	ohm
Optical Output Power [3]	*Po*	-8.2	---	+0.5	dBm
Transmitter & Dispersion Penalty	*TDP*	---	---	3.2	dB
Optical Wavelength	λ_o	1290	1310	1330	nm
Extinction Ratio	*ET*	3.5	---	---	dB
Total Output Jitter	*TOJ*	---	---	0.35	UI
Total Deterministic Output Jitter	*TDJ*	---	---	0.17	UI
Side Mode Suppression Ratio	*SMSR*	30	---	---	dB

Notes:

1. Module is designed for AC coupling. DC voltage will be filtered by internal capacitors.
2. Single ended will be 50 ohm for each signal line.
3. Output of coupling optical power into 9/125 μm SMF.
4. Refer to OptixCom "X2 Design Reference Guide" or IEEE 802.3ae for more design details.

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Receiver Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Operating Wavelength	λ_C	1260	---	1600	nm
Receiver Sensitivity [1]	P_I	-14.4	---	+0.5	dBm
Receiver Sensitivity in OMA [1]	P_{IOMA}	---	---	-12.6	dBm
RX Stressed Sensitivity in OMA [1]	P_{SOMA}	---	---	-10.3	dBm
Differential Output Voltage	ΔV_O	0.8	---	1.6	V
Differential Input Impedance [2]	Z	---	100	---	Ohm

Notes:

1. Test at 10 Gb/s, 2^{31} – 1 PRBS data pattern, and > $1x10^{-12}$ of Bit-Error-Rate (BER).
2. Single ended will be 50 ohm for each signal line.
3. Refer to OptixCom "X2 Design Reference Guide" or IEEE 802.3ae for more design details.

Electrical Signal Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
1.2 V CMOS					
Input High Voltage	$V_{IL(MAX)}$	---	---	0.36	V
Input Low Voltage	$V_{IH(MIN)}$	0.84	---	1.25	V
Capacitance		---	---	320	pF
Pull Up Resistance	R_{pull}	10k	---	22k	Ohm
MDIO I/O					
Output Low Voltage	V_{OL}	-0.3	---	0.2	V
Output Low Current	I_{OL}	---	---	4	mA
Input High Voltage	V_{IH}	0.84	---	1.5	V
Input Low Voltage	V_{IL}	-0.3	---	0.36	V
Pull-Up Supply Voltage	V_{PULL}	1.14	1.2	1.26	
Input Capacitance	C_{IN}	---	---	10	pF
Load Capacitance	C_{LOD}	---	---	470	pF
External Pull-Up Resistance	E_{pull}	200	---	---	Ohm

Class 1 Laser Product
Complies with
21 CFR 1040.10 and 1040.11

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Description

OptixCom's X2 fiber optics transceiver is designed with advanced 1550 nm EA-DFB laser and high speed electronics to achieve the optimum performance for optical interconnect applications. It is compliant with the X2 Multi-Source Agreement (MSA).

X2 uses the same 70-pin electrical connector as XENPAK and supports implementations of XENPAK's four lane XAUI (10 Gigabit attachment unit interface) at both Ethernet (3.125 Gb/sec) and/or Fiber Channel (3.1875 Gb/sec) rates.

The transceiver uses duplex SC connector for the optical interface and is hot pluggable in the z-axis. The transceiver has >15 dB of power budget for 40 km and >24 dB for 80 km of transmission distance with single mode fibers. The product is RoHS compliant. Total power consumption is < 4W.

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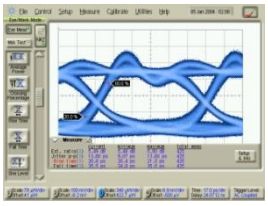
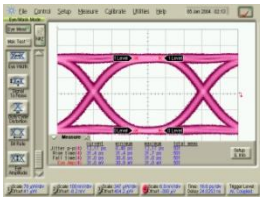
X2-10000EX-AT*XX*K
(*XX* = 40, 80)

10 Gb/s, 2^{31}-1 NRZ data eye pattern

TX



RX



Key Features

- Standard XAUI interface with 3Gb/s per channel
- 1550 nm single mode, 40/80 km, 10 Gb/s data rate
- > 15 dB power budget for 40 km
- > 24 dB power budget for 80 km
- Duplex SC connector optical interface
- 70-pin Z-axis hot pluggable connector
- AC coupling CML differential I/O logics
- Compliant with X2 MSA standard
- Compliant with IEEE 802.3ae, 10GBASE-ER/ZR
- Compliant with 10G FC Fiber Channel Standard
- RoHS compliant

Ordering Information

Part Number: X2-10000EX-AT***XX***K

Description:

1550 nm 10 Gb/s, single mode, X2 fiber optics transceiver, ***XX*** km reach, 0-70°C.

XX = 40, 80.

Applications

- ✓ 10G Fiber Channel & Ethernet
- ✓ OC192/STM-64 for SONET/SDH
- ✓ High speed I/O for file server
- ✓ Data Communication for SAN and LAN
- ✓ Central offices routers and switches
- ✓ Mass storage systems interconnect
- ✓ Computer cluster cross-connect

Operating Conditions

Parameter	Min.	Typical	Max.	Units
Operate Temperature	0	25	70	°C
Data Rate	9.95	---	11.3	Gb/s
Supply Voltage (3.3V)	3.1	3.3	3.5	V
Supply Voltage (5V)	4.75	5	5.25	V
Adaptable Power Supply	1.15	1.2	1.25	V
Module Power Dissipation	---	---	4	W

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Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Units
Storage Temperature	*Tst*	-20	85	°C
Supply Voltage @ 3.3V	*Vcc3*	-0.5	4.0	V
Supply Voltage @ 5V	*Vcc5*	-0.5	6.0	V
Supply Voltage (APS)	*Vaps*	0	1.5	V
Humidity	*R.H.*	0	85	%

General Transmitter Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
XAUI Data Rate	*XDR*	---	3.125	---	Gb/s
XAUI Baud Rate Tolerance	*XBRT*	-100	---	+100	ppm
Differential Input Voltage [1]	*ΔVi*	0.2	---	1.6	V
Differential Input Impedance [2]	*Z*	---	100	---	ohm
Optical Wavelength	λo	1530	---	1565	nm
Side Mode Suppression Ratio	*SMSR*	30	---	---	dB

General Receiver Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Differential Output Voltage	*ΔVo*	0.8	---	1.6	V
Operating Wavelength	λc	1260	---	1600	nm
Differential Input Impedance [2]	*Z*	---	100	---	Ohm
Rise/Fall Time (20% - 80%)	*Tr/Tf*	---	---	40	ps

Notes:

1. Module is designed for AC coupling. DC voltage will be filtered by internal capacitors.
2. Single ended will be 50 ohm for each signal line.
3. Refer to OptixCom "X2 Design Reference Guide" or IEEE 802.3ae for more design details.

Class 1 Laser Product
Complies with
21 CFR 1040.10 and 1040.11

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Electrical Signal Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
1.2 V CMOS					
Input High Voltage	$V_{IL(MAX)}$	---	---	0.36	V
Input Low Voltage	$V_{IH(MIN)}$	0.84	---	1.25	V
Capacitance		---	---	320	pF
Pull Up Resistance	R_{pull}	10k	---	22k	Ohm
MDIO I/O					
Output Low Voltage	V_{OL}	-0.3	---	0.2	V
Output Low Current	I_{OL}	---	---	4	mA
Input High Voltage	V_{IH}	0.84	---	1.5	V
Input Low Voltage	V_{IL}	-0.3	---	0.36	V
Pull-Up Supply Voltage	V_{PULL}	1.14	1.2	1.26	
Input Capacitance	C_{IN}	---	---	10	pF
Load Capacitance	C_{LOD}	---	---	470	pF
External Pull-Up Resistance	E_{pull}	200	---	---	Ohm

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http://www.OptixCom.com
http://www.OpticalTransceiver.com

Transmitter Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Optical Output Power [1]	*Po*	-1	---	+2	dBm
Optical Wavelength	*λo*	1530	1550	1565	nm
Extinction Ratio	*ET*	9	---	---	dB

Receiver Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Receiver Sensitivity [2]	*PI*	-15.8	---	-1.0	dBm
Receiver Sensitivity in OMA [2]	*PIOMA*	---	---	-14.1	dBm
RX Stressed Sensitivity in OMA [2]	*PSOMA*	---	---	-11.3	dBm
Reflectance	*Rrx*	---	---	-26	dB

Notes:

1. Output of coupling optical power into 9/125 μm SMF.
2. Test at 10 Gb/s, 2^{31} – 1 PRBS data pattern, and > $1x10^{-12}$ of Bit-Error-Rate (BER).
3. Refer to OptixCom "X2 Design Reference Guide" or IEEE 802.3ae for more design details.

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Transmitter Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Optical Output Power [1]	P_O	0	---	+4	dBm
Optical Wavelength	λ_O	1530	1550	1565	nm
Extinction Ratio	*ET*	9	---	---	dB

Receiver Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Receiver Sensitivity [2]	P_I	-24	---	-7	dBm
Receiver Sensitivity in OMA [2]	P_{IOMA}	---	---	-22	dBm
RX Stressed Sensitivity in OMA [2]	P_{SOMA}	---	---	-19	dBm
Reflectance	*Rrx*	---	---	-26	dB

Notes:

1. Output of coupling optical power into 9/125 μm SMF.
2. Test at 10 Gb/s, 2^{31} – 1 PRBS data pattern, and > $1x10^{-12}$ of Bit-Error-Rate (BER).
3. Refer to OptixCom "X2 Design Reference Guide" or IEEE 802.3ae for more design details.

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Description

OptixCom's X2 CWDM fiber optics transceiver is designed with advanced EA-DFB laser and high speed electronics receiver that covers the wavelength spectrum from 1470 nm to 1610 nm, with industry standard 20 nm spacing. It is compliant with the X2 Multi-Source Agreement (MSA).

X2 uses the same 70-pin electrical connector as XENPAK and supports implementations of XENPAK's four lane XAUI (10 Gigabit attachment unit interface) at both Ethernet (3.125 Gb/sec) and/or Fiber Channel (3.1875 Gb/sec) rates.

The transceiver uses duplex SC connector for the optical interface and is hot pluggable in the z-axis . The transceiver has >15 dB of power budget for 40 km and >24 dB for 80 km of transmission distance with single mode fibers. The product is RoHS compliant. Total power consumption is < 4W.

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X2-10000CEX-AT40K-*XX*
X2-10000CEX-AT80K-*XX*

Key Features

- Standard XAUI interface with 3Gb/s per channel
- CWDM 1470 - 1610 nm, 10 Gb/s data rate
- > 15 dB power budget for 40 km
- > 24 dB power budget for 80 km
- Duplex SC connector optical interface
- 70-pin Z-axis hot pluggable connector
- AC coupling CML differential I/O logics
- Compliant with X2 MSA standard
- Compliant with IEEE 802.3ae, 10GBASE-ER/ZR
- Compliant with 10G FC Fiber Channel Standard
- RoHS compliant

Ordering Information

Part Number: X2-10000CEX-AT40K-***XX***

CWDM, 1470 - 1610 nm 10 Gb/s, single mode, X2 fiber optics transceiver, 40 km, 1***XX***0 nm wavelength, 0 -70°C

Part Number: X2-10000CEX-AT80K-***XX***

CWDM, 1470 - 1610 nm 10 Gb/s, single mode, X2 fiber optics transceiver, 80 km, 1***XX***0 nm wavelength, 0 -70°C

XX specifies the wavelength described below. For example, X2-10000CEX-AT40K-57 is the 1570 nm CWDM module.

XX	Wavelength	*XX*	Wavelength
47	1470 nm	55	1550 nm
49	1490 nm	57	1570 nm
51	1510 nm	59	1590 nm
53	1530 nm	61	1610 nm

Applications

- ✓ 10G Fiber Channel & Ethernet
- ✓ OC192/STM-64 for SONET/SDH
- ✓ High speed I/O for file server
- ✓ Data Communication for SAN and LAN
- ✓ Central offices routers and switches
- ✓ Mass storage systems interconnect
- ✓ Computer cluster cross-connect

Operating Conditions

Parameter	Min.	Typical	Max.	Units
Operate Temperature	0	25	70	°C
Data Rate	9.95	---	11.3	Gb/s
Supply Voltage (3.3V)	3.1	3.3	3.5	V
Supply Voltage (5V)	4.75	5	5.25	V
Adaptable Power Supply	1.15	1.2	1.25	V
Module Power Dissipation	---	---	4	W

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Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Units
Storage Temperature	*Tst*	-20	85	°C
Supply Voltage @ 3.3V	*Vcc3*	-0.5	4.0	V
Supply Voltage @ 5V	*Vcc5*	-0.5	6.0	V
Supply Voltage (APS)	*Vaps*	0	1.5	V
Humidity	*R.H.*	0	85	%

General Transmitter Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
XAUI Data Rate	*XDR*	---	3.125	---	Gb/s
XAUI Baud Rate Tolerance	*XBRT*	-100	---	+100	ppm
Differential Input Voltage [1]	*ΔVi*	0.2	---	1.6	V
Differential Input Impedance [2]	*Z*	---	100	---	ohm
Optical Wavelength	λ_O	-6.5	λ_C	+6.5	nm
Side Mode Suppression Ratio	*SMSR*	30	---	---	dB

General Receiver Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Differential Output Voltage	*ΔVo*	0.8	---	1.6	V
Operating Wavelength	λ_C	1260	---	1620	nm
Differential Input Impedance [2]	*Z*	---	100	---	Ohm
Rise/Fall Time (20% - 80%)	*Tr/Tf*	---	---	40	ps

Notes:

1. Module is designed for AC coupling. DC voltage will be filtered by internal capacitor.
2. Single ended will be 50 ohm for each signal line.
3. Refer to OptixCom "X2 Design Reference Guide" or IEEE 802.3ae for more design details.

Class 1 Laser Product
Complies with
21 CFR 1040.10 and 1040.11

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Transmitter Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Optical Output Power [1] (X2-10000CEX-AT40K-XX)	P_O	-1	---	+2	dBm
Optical Output Power [1] (X2-10000CEX-AT80K-XX)	P_O	0	---	+4	dBm
Side Mode Suppression Ratio	*SMSR*	30	---	---	dB
Extinction Ratio	*ET*	9	---	---	dB
Center Wavelength – 1470 nm	λ_C	1464.5	1470	1477.5	nm
Center Wavelength – 1490 nm	λ_C	1484.5	1490	1497.5	nm
Center Wavelength – 1510 nm	λ_C	1504.5	1510	1517.5	nm
Center Wavelength – 1530 nm	λ_C	1524.5	1530	1537.5	nm
Center Wavelength – 1550 nm	λ_C	1544.5	1550	1557.5	nm
Center Wavelength – 1570 nm	λ_C	1564.5	1570	1577.5	nm
Center Wavelength – 1590 nm	λ_C	1584.5	1590	1597.5	nm
Center Wavelength – 1610 nm	λ_C	1604.5	1610	1617.5	nm

Notes:

1. Output of coupling optical power into 9/125 μm SMF.

Electrical Signal Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
1.2 V CMOS					
Input High Voltage	$V_{IL(MAX)}$	---	---	0.36	V
Input Low Voltage	$V_{IH(MIN)}$	0.84	---	1.25	V
Capacitance		---	---	320	pF
Pull Up Resistance	R_{pull}	10k	---	22k	Ohm
MDIO I/O					
Output Low Voltage	V_{OL}	-0.3	---	0.2	V
Output Low Current	I_{OL}	---	---	4	mA
Input High Voltage	V_{IH}	0.84	---	1.5	V
Input Low Voltage	V_{IL}	-0.3	---	0.36	V
Pull-Up Supply Voltage	V_{PULL}	1.14	1.2	1.26	
Input Capacitance	C_{IN}	---	---	10	pF
Load Capacitance	C_{LOD}	---	---	470	pF
External Pull-Up Resistance	E_{pull}	200	---	---	Ohm

X2-10000CEX-AT40K-XX

Receiver Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Receiver Sensitivity [1]	*PI*	-15.8	---	-1.0	dBm
Receiver Sensitivity in OMA [1]	*PIOMA*	---	---	-14.1	dBm
RX Stressed Sensitivity in OMA [1]	*PSOMA*	---	---	-12	dBm
Reflectance	*Rrx*	---	---	-26	dB

X2-10000CEX-AT80K-XX

Receiver Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Receiver Sensitivity [1]	*PI*	-24	---	-7	dBm
Receiver Sensitivity in OMA [1]	*PIOMA*	---	---	-22	dBm
RX Stressed Sensitivity in OMA [1]	*PSOMA*	---	---	-19	dBm
Reflectance	*Rrx*	---	---	-26	dB

1. Test at 10 Gb/s, $2^{31} - 1$ PRBS data pattern, and > $1x10^{-12}$ of Bit-Error-Rate (BER).

Class 1 Laser Product
Complies with
21 CFR 1040.10 and 1040.11

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Description

OptixCom's X2 DWDM fiber optics transceiver is designed with advanced EA-DFB laser and high speed electronics receiver . It's used in 100 GHz channel spacing DWDM systems for ITU channels from 17 to 61. The transceiver is compliant with the X2 Multi-Source Agreement (MSA).

X2 uses the same 70-pin electrical connector as XENPAK and supports implementations of XENPAK's four lane XAUI (10 Gigabit attachment unit interface) at both Ethernet (3.125 Gb/sec) and/or Fiber Channel (3.1875 Gb/sec) rates.

The transceiver uses duplex SC connector for the optical interface and is hot pluggable in the z-axis. The transceiver has >15 dB of power budget for 40 km and >24 dB for 80 km of transmission distance with single mode fibers. The product is RoHS compliant. Total power consumption is < 4W.

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X2-10000DEX-AT40K-*XX*
X2-10000DEX-AT80K-*XX*

Key Features

- Standard XAUI interface with 3Gb/s per channel
- Cover ITU channels 17-61, 10 Gb/s data rate.
- > 15 dB power budget for 40 km
- > 24 dB power budget for 80 km
- Duplex SC connector optical interface
- 70-pin Z-axis hot pluggable connector
- AC coupling CML differential I/O logics
- Compliant with X2 MSA standard
- Compliant with IEEE 802.3ae, 10GBASE-ER/ZR
- Compliant with 10G FC Fiber Channel Standard
- RoHS compliant

Ordering Information

Part Number: X2-10000DEX-AT40K-***XX***

DWDM, 10 Gb/s, single mode, X2 fiber optics transceiver, 40 km, ***XX*** ITU channel code 17-61, 0 -70°C.

Part Number: X2-10000DEX-AT80K-***XX***

DWDM, 10 Gb/s, single mode, X2 fiber optics transceiver, 80 km, XX ITU channel code 17-59, 0 -70°C

XX specifies ITU channel code associated with the wavelength For example, X2-10000DEX-AT40K-17 is the 1ITU-17 channel with the 1563.86 nm wavelength and 191.7 THz frequency.

Applications

- ✓ 10G Fiber Channel & Ethernet
- ✓ OC192/STM-64 for SONET/SDH
- ✓ High speed I/O for file server
- ✓ Data Communication for SAN and LAN
- ✓ Central offices routers and switches
- ✓ Mass storage systems interconnect
- ✓ Computer cluster cross-connect

Operating Conditions

Parameter	Min.	Typical	Max.	Units
Operate Temperature	0	25	70	°C
Data Rate	9.95	---	11.3	Gb/s
Supply Voltage (3.3V)	3.1	3.3	3.5	V
Supply Voltage (5V)	4.75	5	5.25	V
Adaptable Power Supply	1.15	1.2	1.25	V
Module Power Dissipation	---	---	4	W

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Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Units
Storage Temperature	*Tst*	-20	85	°C
Supply Voltage @ 3.3V	*Vcc3*	-0.5	4.0	V
Supply Voltage @ 5V	*Vcc5*	-0.5	6.0	V
Supply Voltage (APS)	*Vaps*	0	1.5	V
Humidity	*R.H.*	0	85	%

DWDM ITU Grid Wavelength Guide

ITU Code	Frequency (THz)	Wavelength (nm)	ITU Code	Frequency (THz)	Wavelength (nm)
17	191.7	1563.86	40	194.0	1545.32
18	191.8	1563.05	41	194.1	1544.53
19	191.9	1562.23	42	194.2	1543.73
20	192.0	1561.42	43	194.3	1542.94
21	192.1	1560.61	44	194.4	1542.14
22	192.2	1559.79	45	194.5	1541.35
23	192.3	1558.98	46	194.6	1540.56
24	192.4	1558.17	47	194.7	1539.77
25	192.5	1557.36	48	194.8	1538.98
26	192.6	1556.56	49	194.9	1538.19
27	192.7	1555.75	50	195.0	1537.40
28	192.8	1554.94	51	195.1	1536.61
29	192.9	1554.13	52	195.2	1535.82
30	193.0	1553.33	53	195.3	1535.04
31	193.1	1552.52	54	195.4	1534.25
32	193.2	1551.72	55	195.5	1533.47
33	193.3	1550.92	56	195.6	1532.68
34	193.4	1550.12	57	195.7	1531.90
35	193.5	1549.32	58	195.8	1531.12
36	193.6	1548.52	59	195.9	1530.33
37	193.7	1547.72	60	196.0	1529.55
38	193.8	1546.92	61	196.1	1528.77
39	193.9	1546.12			

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General Transmitter Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
XAUI Data Rate	X_{DR}	---	3.125	---	Gb/s
XAUI Baud Rate Tolerance	X_{BRT}	-100	---	+100	ppm
Differential Input Voltage [1]	ΔVi	0.2	---	1.6	V
Differential Input Impedance [2]	Z	---	100	---	ohm
Channel Spacing	Δf	---	100	---	GHz
Side Mode Suppression Ratio	SMSR	30	---	---	dB

General Receiver Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Differential Output Voltage	ΔV_O	0.8	---	1.6	V
Differential Input Impedance [2]	Z	---	100	---	Ohm
Differential Output Amplitude	Vout P-P	800	---	1600	mV
Rise/Fall Time (20% - 80%)	Tr/Tf	---	---	40	ps

Notes:

1. Module is designed for AC coupling. DC voltage will be filtered by internal capacitor.
2. Single ended will be 50 ohm for each signal line.

Electrical Signal Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
1.2 V CMOS					
Input High Voltage	$V_{IL(MAX)}$	---	---	0.36	V
Input Low Voltage	$V_{IH(MIN)}$	0.84	---	1.25	V
Capacitance		---	---	320	pF
Pull Up Resistance	R_{pull}	10k	---	22k	Ohm
MDIO I/O					
Output Low Voltage	V_{OL}	-0.3	---	0.2	V
Output Low Current	I_{OL}	---	---	4	mA
Input High Voltage	V_{IH}	0.84	---	1.5	V
Input Low Voltage	V_{IL}	-0.3	---	0.36	V
Pull-Up Supply Voltage	V_{PULL}	1.14	1.2	1.26	
Input Capacitance	C_{IN}	---	---	10	pF
Load Capacitance	C_{LOD}	---	---	470	pF
External Pull-Up Resistance	Epull	200	---	---	Ohm

Transmitter Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Optical Output Power [1]	P_O	-1	---	+2	dBm
Extinction Ratio	ET	9	---	---	dB
Center Wavelength (Start of Life)	λ_C	λ_C - 25	λ_C	λ_C + 25	pm
Center Wavelength (End of Life)	λ_C	λ_C - 100	λ_C	λ_C + 100	pm

Receiver Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Receiver Sensitivity [2]	P_I	-15.8	---	-1.0	dBm
Receiver Sensitivity in OMA [2]	P_{IOMA}	---	---	-14.1	dBm
RX Stressed Sensitivity in OMA [2]	P_{SOMA}	---	---	-12	dBm
Reflectance	R_{RX}	---	---	-26	dB

Notes:

1. Output of coupling optical power into 9/125 μm SMF.
2. Test at 10 Gb/s, 2^{31} – 1 PRBS data pattern, and > $1x10^{-12}$ of Bit-Error-Rate (BER).

Class 1 Laser Product
Complies with
21 CFR 1040.10 and 1040.11

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Transmitter Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Optical Output Power [1]	P_O	0	---	+4	dBm
Extinction Ratio	ET	9	---	---	dB
Center Wavelength (Start of Life)	λ_C	λ_C - 25	λ_C	λ_C + 25	pm
Center Wavelength (End of Life)	λ_C	λ_C - 100	λ_C	λ_C + 100	pm

Receiver Electro-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Receiver Sensitivity [2]	P_I	-24	---	-7	dBm
Receiver Sensitivity in OMA [2]	P_{IOMA}	---	---	-22	dBm
RX Stressed Sensitivity in OMA [2]	P_{SOMA}	---	---	-19	dBm
Reflectance	Rrx	---	---	-26	dB

Notes:

1. Output of coupling optical power into 9/125 μm SMF.
2. Test at 10 Gb/s, 2^{31} – 1 PRBS data pattern, and > $1x10^{-12}$ of Bit-Error-Rate (BER).

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