

TS-X2-CWDM-40

10Gbps CWDM X2 Optical Transceiver, 40km Reach

Features

- Compatible with X2 MSA Rev.2.0b
- Support of IEEE 802.3ae, 10GBASE-ER application
- Wavelength selectable to ITU-T standards covering CWDM grid wavelengths
- Transmission distance up to 40km over SMF
- Low Power Consumption 2.0 W (typ.)
- Case Temperature Range: Standard: 0°C - 70°C
- Cooled EA-DFB/PIN-PD
- Laser Class 1 compliant
- Duplex SC connector
- Hot pluggable 70-pin connector with XAUI electrical interface
- Management and control via MDIO 2-wire interface
- Complaint with the EU RoHS 6 Environmental requirements



Applications

- 10 Gb/s Ethernet transmission systems

Description

The TS-X2-CWDM-40 Series is highly integrated, serial optical transponder module for high-speed, 10Gbit/s data transmission applications. The module is fully compliant to IEEE 802.3ae standard for Ethernet, making it ideally suited for 10GbE datacom (rack to-rack, client interconnection) applications. The transponder module comprises a transmitter with a directly modulated CWDM EML laser, a receiver with a PIN photodiode, a XAUI-Attachment Interface, an integrated Coder/Decoder and multiplexer / de-multiplexer (SERDES: Serializer/Deserializer).

The transponder operates within a wide case temperature range of -5°C to +70°C and offers optimum heat dissipation and excellent electromagnetic shielding which enables high port densities for 10GbE systems. A 70 pins electrical connector and a duplex SC connector optical interface assure that connectivity is compliant to the X2 and XENPAK MSA. This module is designed for single mode fiber and operates at a nominal wavelength of CWDM wavelength. There are eight center wavelengths available from 1470nm to 1610nm, with each step 20nm.

Digital diagnostic monitoring (DDM) is implemented and fully compliant with X2 DDM architecture. The unit monitors temperature, receive optical power, transmit optical power, and laser bias current.

Absolute Maximum Ratings ^{*Note}

Parameter	Symbol	Min	Max	Unit
Supply Voltage Range @ 3.3V	V _{cc3}	-0.5	4.0	V
Adaptable Power Supply (APS)	V _{APS}	0	2	V
Operating Relative Humidity	RH		80	%
Storage Temperature	T _s	-20	+85	°C

Note: Exceeding any one of these values may destroy the device permanently.

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Operating Case Temperature	T _c	0		+70	°C
Power Supply Voltage @ 3.3V	V _{cc3}	3.14	3.3	3.47	V
Adaptable Power Supply (APS)	V _{APS}	1.14	1.2	1.26	V
Power Dissipation	PD		3.5	4	W

Optical Interface

Parameter	Symbol	Min	Typical	Max	Unit
Transmitter Characteristics					
Center Wavelength	λ_c	1464.5		1617.5	nm
Center wavelength stability	$\Delta\lambda_D$	-6.5	λ_c	6.5	nm
Optical Transmit Power	Po	-1		4	dBm
Optical Transmit Power (disabled)	Ptx-dis			-40	dBm
Extinction Ratio	ER	9			dB
Side Mode Suppression Ratio	SMSR	30			dB
Eye Mask	IEEE 802.3ae Compliant				
Receiver Characteristics					
Input Operating Wavelength	λ	1260		1600	nm
Received power 1	Rpo	-16.5		-1	dBm
Maximum Input Power	RX-overload	-7			dBm
Reflectance	Rrx			-26	dB

Electrical Characteristics

Parameter	Symbol	Min	Typical	Max	Unit
Transmitter					
Data Rate (TXLINE0-3)	TX-xaui		3125		Mbps
Differential impedance	Zo	80	100	120	Ω
Differential Input Amplitude	Vin P-P	160		2000	mVpp
Input Rise/Fall	TR / TF	60		130	ps
Differential Impedance of Zin	Zin		100		ohm
Receiver					
Data Rate (TXLINE0-3)	RX-xaui		3125		Mbps
Supply Voltage	VccRX	3.13	3.3	3.47	V
Differential Output Amplitude	Vout P-P	800		1600	mV
Rise/Fall Time	Tr / Tf	50		90	ps
Differential Impedance of Zout	Zout		100		ohm

MDIO Interface
DC Characteristics

Characteristic	Condition	Symbol	Minimum	Maximum	Unit
Input high voltage		V _H	0.84	1.5	V
Input low voltage		V _L	-0.3	0.36	V
MDIO Input current	MMD Driver in tri-state	I _{MDIO}	-10	8	pA
MDC Input current		I _{MDC}	-5	5	pA
Output low voltage	IOL= 100pA	V _{QL}	-0.3		V
	IOL= 4mA	V _{QL}		0.2	V
Output high voltage	RPULL-Up = 357 Ω $\pm$ 1% VPULL-Up =1.14~1.5V	V _{QH}	1.136	1.5	V
Output low current	VI = 0.2V	I _{QL}	4		mA
MDIO Input capacitance	VI = 0~1.5V	Cin		10	pF

CWDM Wavelength (0°C ~70°C)

Band	Nomenclature	Wavelength(nm)		
		Min	Typ	Max
S-band Short Wavelength	47	1464	1470	1477.5
	49	1484	1490	1497.5
	51	1504	1510	1517.5

	53	1524	1530	1537.5
C-band Conventional	55	1544	1550	1557.5
L-band Long Wavelength	57	1564	1570	1577.5
	59	1584	1590	1597.5
	61	1604	1610	1617.5

Note: 8 Wavelengths from 1470nm to 1610nm, each step 20nm.

Electrical Pad Layout

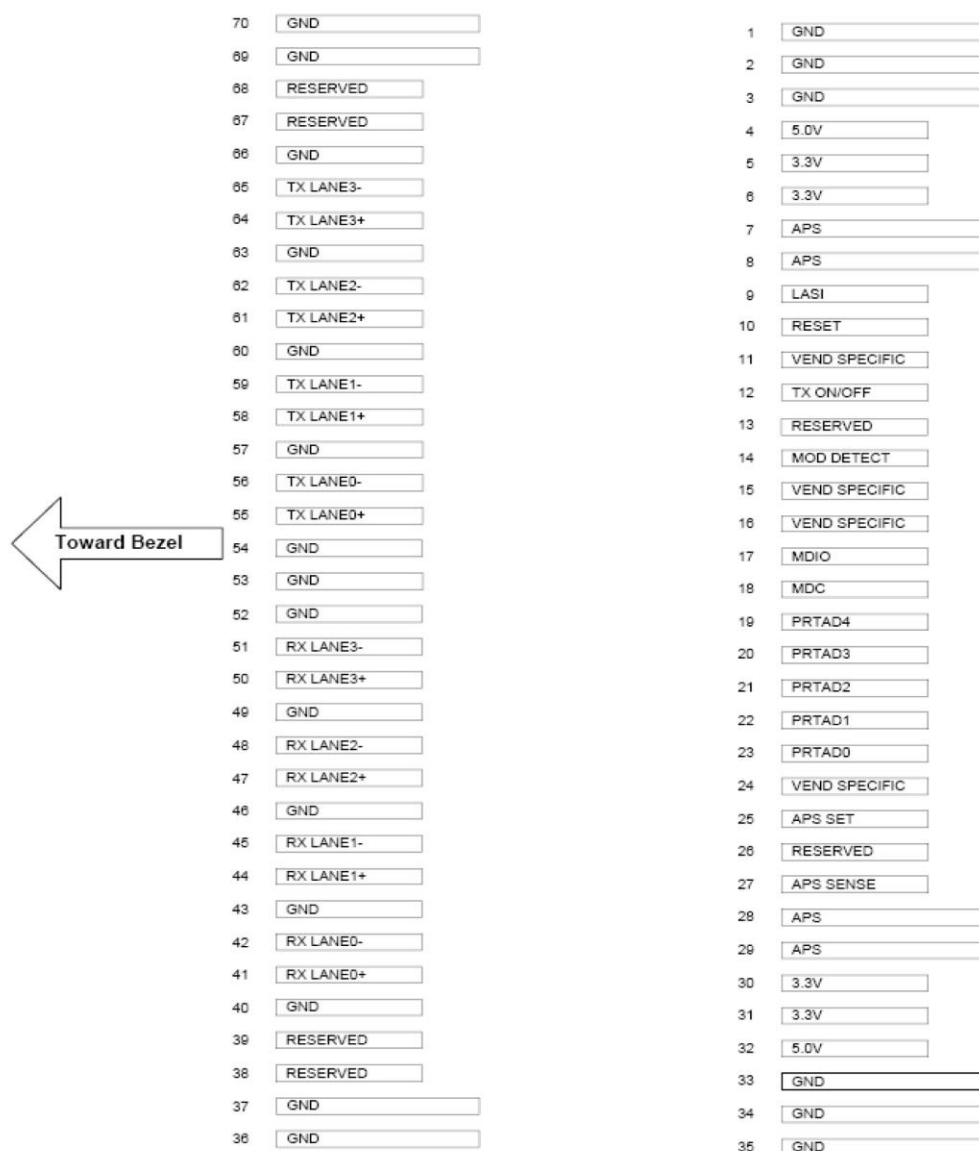


Figure2.Electrical Pin-out Details

Pin Descriptions

Pin No.	Name	Dir	Function	Note
1	GND		Electrical Ground	1
2	GND		Electrical Ground	1
3	GND		Electrical Ground	1
4	5.0V		Power	2
5	3.3V		Power	2
6	3.3V		Power	2
7	APS =1.2V		Adaptive Power Supply	2
8	APS =1.2V		Adaptive Power Supply	2
9	LASI		Open Drain Compatible 10K-22K pull up on host. Logic High: Normal Operation Logic Low : LASIAsserted	3
10	RESET	I	Open Drain compatible. 10-22K pull-up on transceiver Logic high = Normal operation Logic low = Reset Minimum reset assert time 1 ms	3
11	VEND SPECIFIC		Vendor Specific Pin. Leave unconnected when not in use.	6
12	TX ON/OFF	I	Open Drain compatible. 10-22K pull-up on transceiver Logic high = Transmitter On (capable) Logic low = Transmitter Off (always)	3
13	RESERVED		Reserved	3
14	MOD DETECT	O	Pulled low inside module through 1k	
15	VEND SPECIFIC		Vendor Specific Pin. Leave unconnected when not in use.	6
16	VEND SPECIFIC		Vendor Specific Pin. Leave unconnected when not in use.	6
17	MDIO	I/O	Management Data IO	3,4
18	MDC	I	Management Data Clock	3,4
19	PRTAD4	I	Port Address Bit 4 (Low = 0)	3
20	PRTAD3	I	Port Address Bit 3 (Low = 0)	3
21	PRTAD2	I	Port Address Bit 2 (Low = 0)	3
22	PRTAD1	I	Port Address Bit 1 (Low = 0)	3
23	PRTAD0	I	Port Address Bit 0 (Low = 0)	3
24	VEND SPECIFIC		Vendor Specific Pin. Leave unconnected when not in use.	6
25	APS SET		Feedback input for APS	
26	RESERVED		Reserved for Avalanche Photodiode use.	6
27	APS SENSE		APS Sense Connection	
28	APS =1.2V		Adaptive Power Supply	2
29	APS =1.2V		Adaptive Power Supply	2
30	3.3V		Power	2

31	3.3V		Power	2
32	5.0V		Power	2
33	GND		Electrical Ground	1
34	GND		Electrical Ground	1
35	GND		Electrical Ground	1
36	GND		Electrical Ground	1
37	GND		Electrical Ground	1
38	RESERVED		Reserved	
39	RESERVED		Reserved	
40	GND		Electrical Ground	1
41	RX LANE0+	O	Module XAUI Output Lane 0+	5
42	RX LANE0-	O	Module XAUI Output Lane 0-	5
43	GND		Electrical Ground	1
44	RX LANE1+	O	Module XAUI Output Lane 1+	5
45	RX LANE1-	O	Module XAUI Output Lane 1-	5
46	GND		Electrical Ground	1
47	RX LANE2+	O	Module XAUI Output Lane 2+	5
48	RX LANE2-	O	Module XAUI Output Lane 2-	5
49	GND		Electrical Ground	1
50	RX LANE3+	O	Module XAUI Output Lane 3+	5
51	RX LANE3-	O	Module XAUI Output Lane 3-	5
52	GND		Electrical Ground	1
53	GND		Electrical Ground	1
54	GND		Electrical Ground	1
55	TX LANE0+	I	Module XAUI Output Lane 0+	5
56	TX LANE0-	I	Module XAUI Output Lane 0-	5
57	GND		Electrical Ground	1
58	TX LANE1+	I	Module XAUI Output Lane 1+	5
59	TX LANE1-	I	Module XAUI Output Lane 1-	5
60	GND		Electrical Ground	1
61	TX LANE2+	I	Module XAUI Output Lane 2+	5
62	TX LANE2-	I	Module XAUI Output Lane 2-	5
63	GND		Electrical Ground	1
64	TX LANE3+	I	Module XAUI Output Lane 3+	5
65	TX LANE3-	I	Module XAUI Output Lane 3-	5
66	GND		Electrical Ground	1
67	RESERVED		Reserved	
68	RESERVED		Reserved	
69	GND		Electrical Ground	1
70	GND		Electrical Ground	1

Notes:

- 1) Ground connections are common for TX and RX.
- 2) All connector contacts are rated at 0.5A nominal.
- 3) 1.2V CMOS compatible.
- 4) MDIO and MDC timing must comply with IEEE802.3ae, Clause 45.3
- 5) XAUI output characteristics should comply with IEEE802.3ae Clause 47.

6) Transceivers will be MSA compliant when no signals are present on the vendor specific pins.

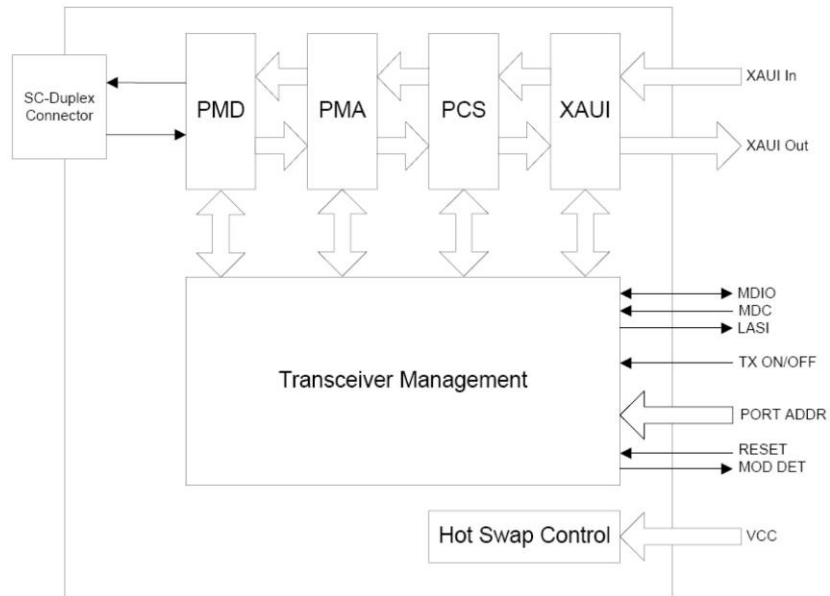
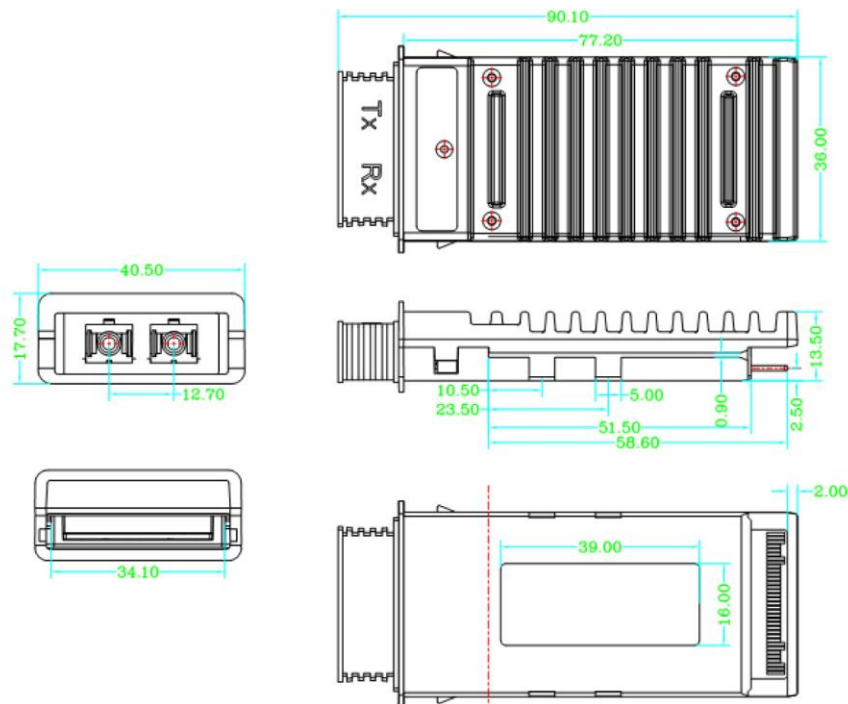


Figure1. Functional Diagram of Typical X2 Style Transceiver

Package Dimensions



Regulatory Compliance

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883G Method 3015.7	Class 1C (>1000 V)
Electrostatic Discharge to the enclosure	EN 55024:1998+A1+A2 IEC-61000-4-2 GR-1089-CORE	Compliant with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022:2006 CISPR 22B :2006 VCCI Class B	Compliant with standards Noise frequency range: 30 MHz to 6 GHz. Good system EMI design practice required to achieve Class B margins. System margins depend on customer host board and chassis design.
Immunity	EN 55024:1998+A1+A2 IEC 61000-4-3	Compliant with standards. 1kHz sine-wave, 80% AM, from 80 MHz to 1 GHz. No effect on transmitter/receiver performance is detectable between these limits.
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN (IEC) 60825-1:2007 EN (IEC) 60825-2:2004+A1	CDRH compliant and Class I laser product. TüV Certificate No. 50135086
Component Recognition	UL and CUL EN60950-1:2006	UL file E317337 TüV Certificate No. 50135086 (CB scheme)
RoHS6	2002/95/EC 4.1&4.2 2005/747/EC 5&7&13	Compliant with standards ^{*note}

Note:

For update of the equipments and strict control of raw materials, TONGSION has the ability to supply the customized products since Jan 1st, 2007, which meets the requirements of RoHS6 (Restrictions on use of certain Hazardous Substances) of European Union.

In light of item 5 in RoHS exemption list of RoHS Directive 2002/95/EC, Item 5: Lead in glass of cathode ray tubes, electronic components and fluorescent tubes.

In light of item 13 in RoHS exemption list of RoHS Directive 2005/747/EC, Item 13: Lead and cadmium in optical and filter glass. The three exemptions are being concerned for TONGSION's transceivers, because TONGSION's transceivers use glass, which may contain Pb, for components such as lenses, isolators, and other electronic components.

Ordering information

Part Number	Product Description
TS-X2-CWDM-40	1470nm~1610nm, 10Gbps, SC, 40km, 0°C~+70°C, With DDM

Note: xx refers to CWDM Wavelength, from 1470nm to 1610nm, xx=47, 49...and 61.

Important Notice

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

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