XPS-43100WG **(RoHS Compliant)**

8.5Gb/s 1550 nm / 100 km XFP Single-Mode Optical Transceiver for 8G FC Applications

FEATURES

- Up to 8.5 Gb/s Bi-directional Data Link
- Complaint to XFP MSA
- Compliance with Fibre Channel FC-PI-4 800-SM-LL-L
- Compliant with 4G and 2G Fibre Channel
- SFF-8472 Digital Diagnostic Function
- Temperature-stabilized 1550 nm EML Transmitter
- AC/AC Coupling according to MSA
- Distance up to 100 km
- 2-Wire Interface for Integrated Digital Diagnostic Monitoring
- No Reference Clock required
- Low Power Dissipation < 3.5W
- +3.3 V & +5 V Power Supply
- RoHS 6/6 Compliant
- -5 to 70°C Operating
- Duplex LC Connector

APPLICATIONS

- Multi-rate 8x/4x/2x Fiber Channel

STANDARD

- Compliant with XFP MSA
- Compliant with 8G FC

DESCRIPTION

XPS-43100WG series multi-rate 8G XFP transceiver is designed for serial optical data communications such as 8G Fiber Channel. It supports the 8.5Gbps transmission on 9/125 μm SMF.

The transceiver consists of two sections: The transmitter section consists of a directly modulated 1550 nm electro-absorption (EA) modulated DFB laser, driver and signal conditioner. The receiver section incorporates a PIN photodiode integrated with a trans-impedance preamplifier (TIA) and signal conditioner.

The module is with the XFP 30-pin connector to allow hot plug capability. Integrated Tx and Rx signal conditioners provide high jitter-tolerance for full XFI compliance and no external reference clock required. The internally ac coupled high speed serial I/O simplifies interfacing to external circuitry. 3.3 V & 5 V power supply are needed. The optical output can be disabled by LVTTL logic high-level input of TX_DIS. Loss of signal (RX_LOS) output is provided to indicate the loss of an input optical signal of receiver.

A serial EEPROM in the transceiver allows the user to access transceiver digital diagnostic monitoring and configuration data via the 2-wire XFP Management Interface. This interface uses a single address, A0h, with a memory map divided into a lower and upper area. Basic digital diagnostic data is held in the lower area while specific data is held in a series of tables in the high memory area.

LASER SAFETY

This transceiver is a Class 1 laser product. It complies with IEC-60825 and FDA 21 CFR 1040.10 and 1040.11. The transceiver must be operated within the specified temperature and voltage limits. The optical ports of the module shall be terminated with an optical connector or with a dust plug.

ORDER INFORMATION

P/No.	Bit Rate (Gb/s)	Distance (km)	Wavelength (nm)	Package	Connector	Temp (°C)	RoHS Compliant
XPS-43100WG	8 / 4 / 2	100	1550 EML	XFP with DMI	LC	-5 to 70	Yes

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Absolute Maximum Ratings					
Parameter	**Symbol**	**Min**	**Max**	**Units**	**Notes**
Storage Temperature	Tstg	-40	85	°C	
Operating Case Temperature	Topr	-5	70	°C	
Relative Humidity	RH	0	85	%	Non condensing
Power Supply Voltage (5V)	Vcc5	-0.5	6.0	V	Power Supply Voltage (5V)
Power Supply Voltage (3.3V)	$V_{CC}3$	-0.5	3.6	V	Power Supply Voltage (3.3V)
Input Voltage	---	GND	Vcc3	V	
Receiver Input Power	Pin		-4	dBm	APD Receiver

Recommended Operating Conditions					
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units / Notes**
Power Supply Voltage (5V)	$V_{CC}5$	4.75	5	5.25	V
Power Supply Voltage (3.3V)	$V_{CC}3$	3.13	3.3	3.47	V
Power Supply Current (@5V)	$I_{CC}5$			350	mA
Power Supply Current (@3.3V)	$I_{CC}3$			500	mA
Power Dissipation	P_D			3.5	W
Operating Case Temperature	Topr	-5		70	°C
Data Rate			8.5		Gb/s

Transmitter Optical Specifications (-5°C < Topr < 70°C, Vcc5=5V±5%, Vcc3 = 3.3V ±5%)						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes**
Average Launch Power	$Po_{,Avg}$	-1		3	dBm	1
Extinction Ratio	ER	8.2			dB	2
Output Center Wavelength	λc	1530		1565	nm	
Output Spectrum Width	σλ			1	nm	-20 dB width
Side Mode Suppression Ratio	SMSR	30			dB	
Relative Intensity Noise	RIN			-130	dB/Hz	
Average Launch Power of OFF Transmitter				-30	dBm	

1. Output power is power coupled into a 9/125 μm single-mode fiber.
2. ER=8.2 dB minium for data rate 8.5 Gb/s.

Receiver Optical Specifications (-5°C < Topr < 70°C, 3.13V < Vcc < 3.47V)						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes**
Sensitivity	Sens			-25	dBm	3
Receiver Overload	P_{MAX}	-7	---		dBm	
LOS -- Deasserted	LOS_D	---	---	-30	dBm	Transition: low to high
LOS -- Asserted	LOS_A	-37	---	---	dBm	Transition: high to low
Wavelength of Operation	λc	1530		1565	nm	

3. Average received power; BER < 10^{-12} and PRBS 2^7-1.

Electrical Characteristics						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes**
High-Speed Signal (CML) Interface Specification						
Input Data Rate			8.5		Gps	
TX Clock Tolerance				±100	ppm	1
Differential Input Impedance	Rin		100		Ω	
Differential Data Input Amplitude		120		820	mVpp	2, Internally AC coupled
Output Data Rate			8.5		Gps	
RX Clock Tolerance				±100	ppm	1
Differential Output Impedance	Rout		100		Ω	
Differential Data Output Amplitude		340		850	mVpp	2, Internally AC coupled
Low-Speed Signal (LVTTL) Interface Specification						
Input High Voltage		2.0		Vcc	V	
Input Low Voltage		GND		0.8	V	
Output High Voltage		2.4		Vcc	V	
Output Low Voltage		GND		0.5	V	
Reference Clock (LVPECL) Interface Specification						
No reference clock						

1. Clock tolerance for 8.5Gb/s, 4.25Gb/s, 2.12Gb/s, 1.063Gb/s and 1.25 Gb/s.
2. The differential input and output amplitudes are per XFP MSA mask at points B' and C'.

Transceiver Timing Characteristics						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes**
TX_DIS Assert Time	t_off			10	µs	
TX_DIS Negate Time	t_on			2	ms	
Time to Initialize	t_init			300	ms	
Interrupt Assert Delay	interrupt_on			200	ms	
Interrupt Negate Delay	interrupt_off			500	µs	
P_Down/PST Assert Delay	P_Down/RST_on			100	µs	
P_Down Nagate Delay	P_Down/RST_off			300	ms	
Mod_NR Assert Delay	Mod_nr_on			1	ms	
Mod_NR Negate Delay	Mod_nr_off			1	ms	
Mod_Desel Assert Time	T_Mod_Desel			2	ms	
Mod_Desel De-Assert Time	T_Mod_Sel			2	ms	
P_Down Reset Time	T_reset	10			µs	
RX_LOS Assert Delay	T_Los_on			100	µs	
RX_LOS Negate Delay	T_Los_off			100	µs	
Serial ID Clock Rate	f_{SCL}	0		400	kHz	

Management Interface

The structure of the memory map is shown in Figure 1, which is accessible over a 2-wire serial interface at the 8-bit address 1010000X (A0h). The normal 256 byte I2C address space is divided into low and upper blocks of 128 Bytes. The lower block of 128 Bytes is always directly available and is used for the diagnostics and control function. Multiple blocks of memories are available in the upper 128 Bytes of the address space. These are individually addressed through a table select Byte which the user enters into a location in the lower address space. Thus, there is a total available address space of 128*256 = 32 Kbytes in this upper memory space. The contents of Table 01h are listed in Table 1 below. Please refer SFF INF-8077i (Revision 4.5) for detailed information.

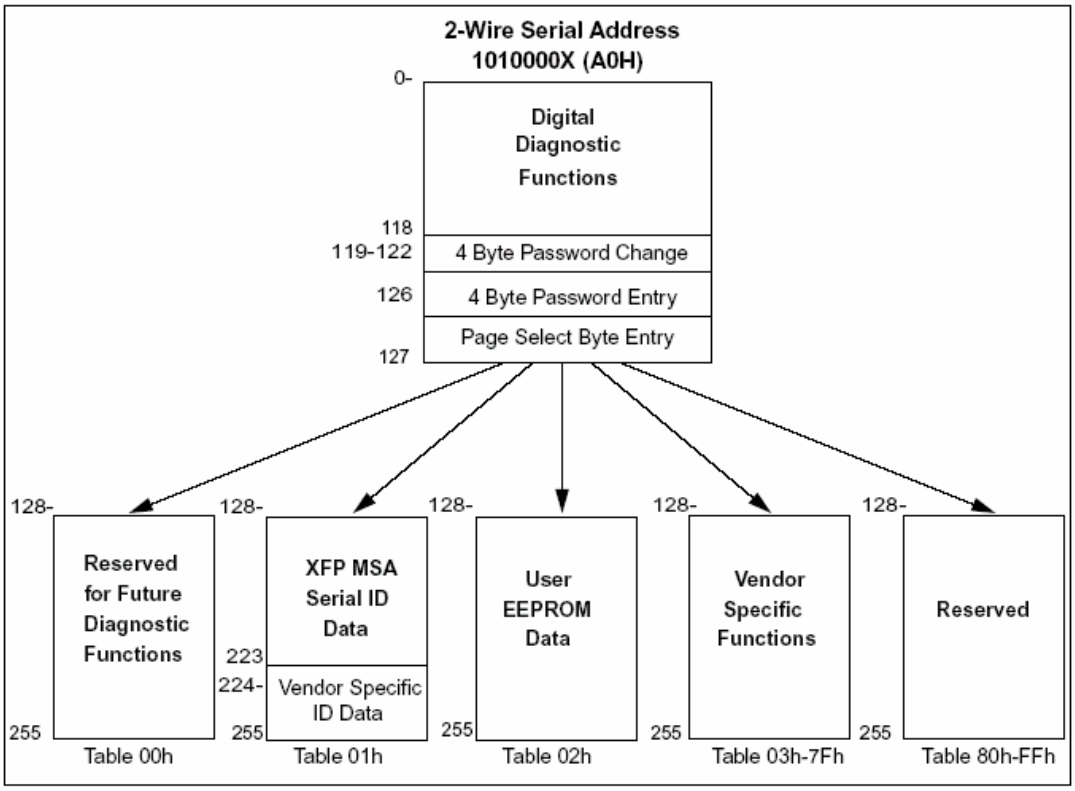


Figure 1. 2-wire Serial Digital Diagnostic Memory Map

Table 1 Monitoring Specification

Data Address	Parameter	Accuracy
96 ~ 97	Temperature	± 3°C
98 ~ 99	Reserved	
100 ~ 101	Tx Bias	± 10%
102 ~ 103	Tx Power	± 2dB
104 ~ 105	Rx Power	± 2dB
106 ~ 107	Vcc3	± 3%

CONNECTION DIAGRAM

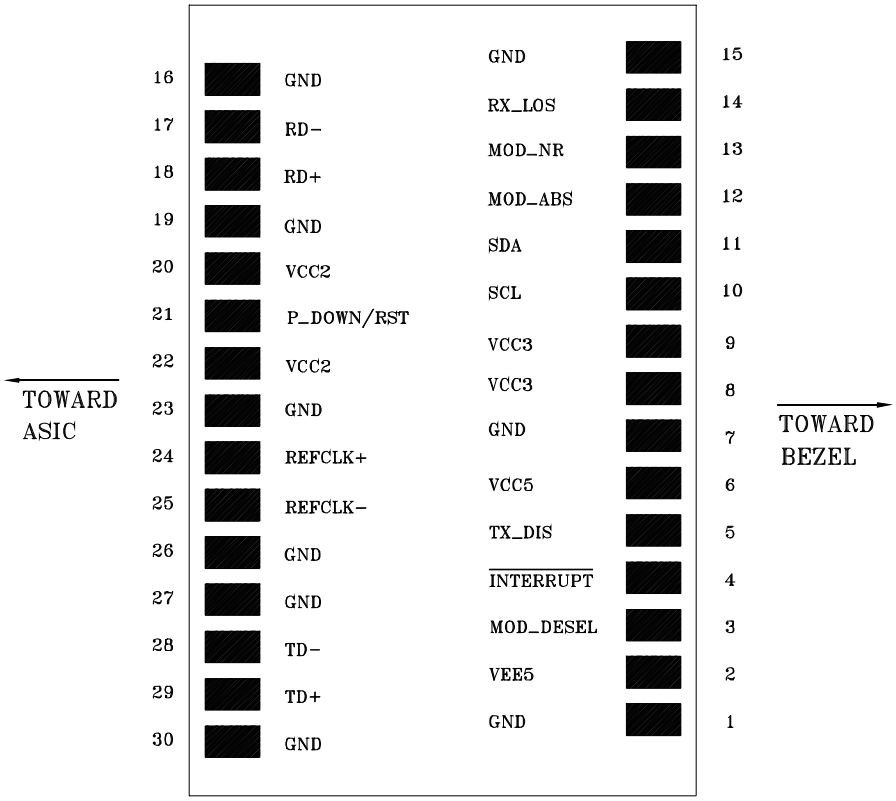


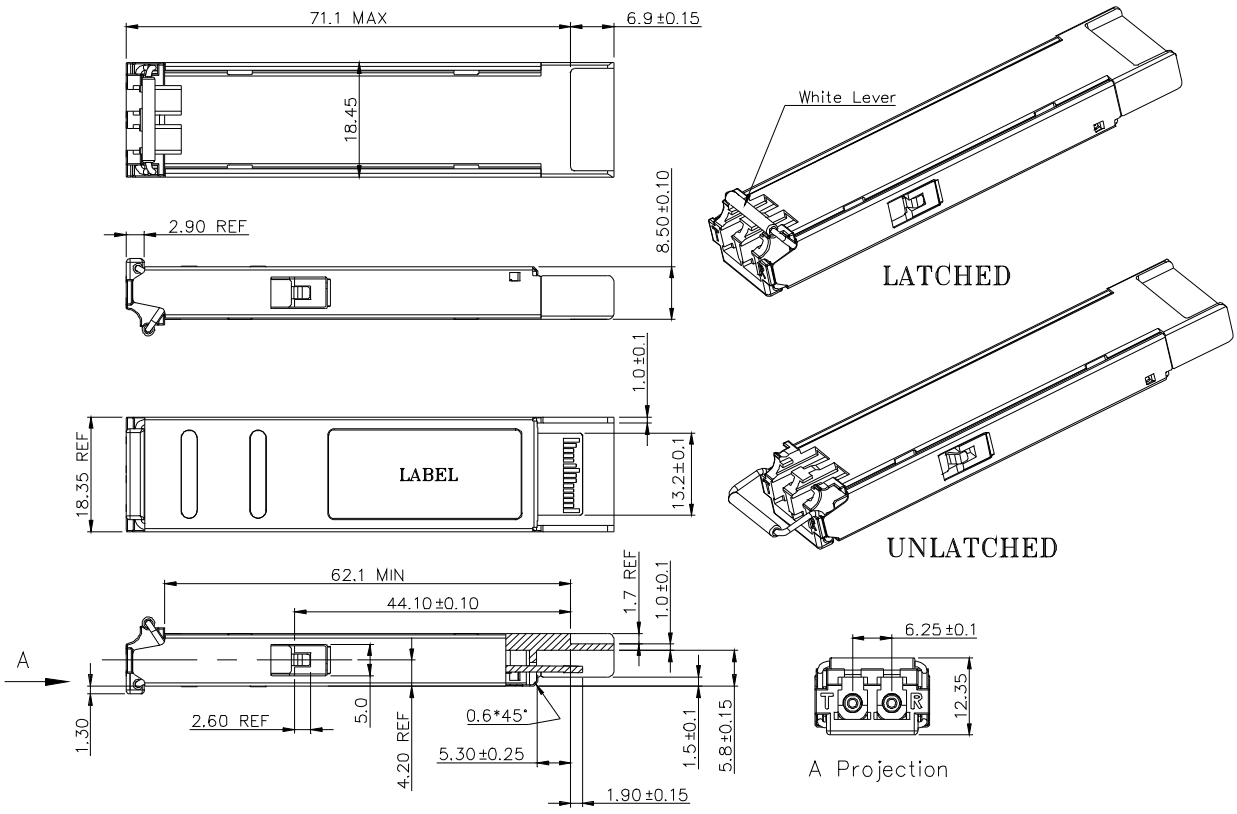
Table 3 PIN Description

PIN	Logic	Signal Name	Description	Note
1		GND	Module Ground	1
2		VEE5	-5.2V Power Supply **(Not required)**	3
3	LVTTL-I	Mod_Desel	Module De-select; When held low allows module to respond to 2-wire serial interface	
4	LVTTL-O	$\overline{\text{Interrupt}}$	$\overline{\text{Interrupt}}$; Indicates presence of an important condition which can be read over the 2wire serial interface	2
5	LVTTL-I	TX_DIS	Transmitter Disable; Turns off transmitter laser output	
6		VCC5	+5V Power Supply	3
7		GND	Module Ground	1
8		VCC3	+3.3V Power Supply	
9		VCC3	+3.3V Power Supply	
10	LVTTL-I/O	SCL	Serial 2-wire interface clock	2
11	LVTTL-I/O	SDA	Serial 2-wire interface data line	2
12	LVTTL-O	Mod_Abs	Indicates Module is not present. Grounded in the Module	2
13	LVTTL-O	Mod_NR	Module Not Ready; Indicating Module Operational Fault	2
14	LVTTL-O	RX_LOS	Receiver Loss Of Signal Indicator	2
15		GND	Module Ground	1
16		GND	Module Ground	1
17	CML-O	RD-	Receiver Inverted Data Output	
18	CML-O	RD+	Receiver Non-Inverted Data Output	
19		GND	Module Ground	1
20		VCC2	+1.8V Power Supply **(Not required)**	3

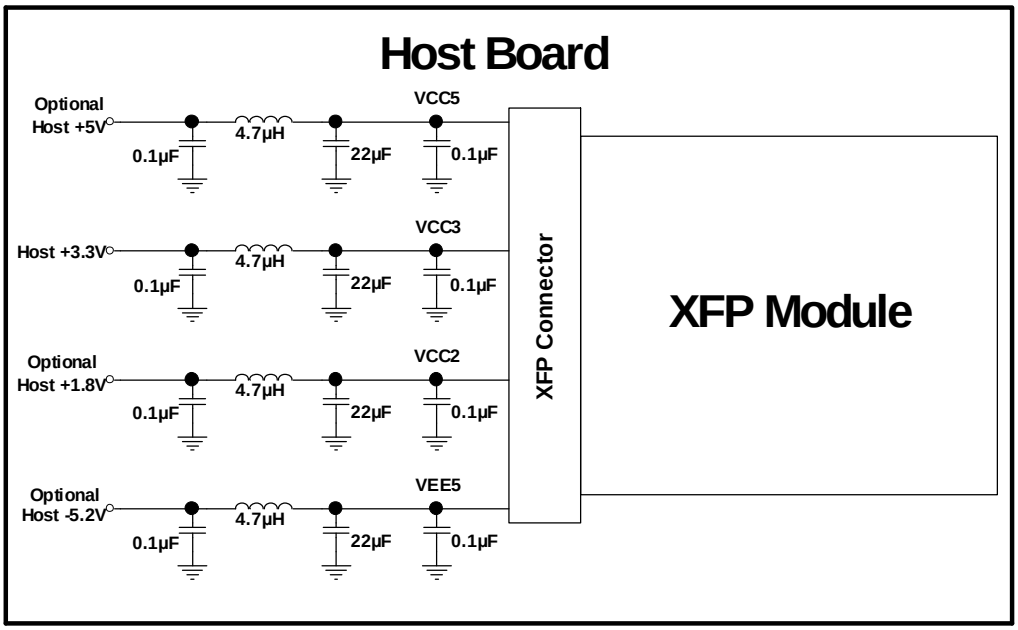
21	LVTTL-I	P_Down/RST	Power down; When high, requires the module to limit power consumption to 1.5W or below. 2-Wire serial interface must be functional in the low power mode. Reset; The falling edge initiates a complete reset of the module including the 2-wire serial interface, equivalent to a power cycle.	
22		VCC2	+1.8V Power Supply **(Not required)**	3
23		GND	Module Ground	1
24	PECL-I	RefCLK+	Reference Clock Non-Inverted Input, AC coupled on the host board. **(Not used. Internally terminated to 50 ohm (100 ohm diff.))**	4
25	PECL-I	RefCLK-	Reference Clock Inverted Input, AC coupled on the host board. **(Not used. Internally terminated to 50 ohm (100 ohm diff.))**	4
26		GND	Module Ground	1
27		GND	Module Ground	1
28	CML-I	TD-	Transmitter Inverted Data Input	
29	CML-I	TD+	Transmitter Non-Inverted Data Input	
30		GND	Module Ground	1

1. Module ground pins GND are isolated from the module case and chassis ground within the module.
2. Shall be pulled up with 4.7K-10Kohms to a voltage between 3.15V and 3.45V on the host board.
3. These PINs are open within module.
4. A Reference Clock input is not required. If present, it will be ignored.

Mechanical Specification (Units in mm)



Recommended Power Circuit Schematic



Recommended Interface Circuit

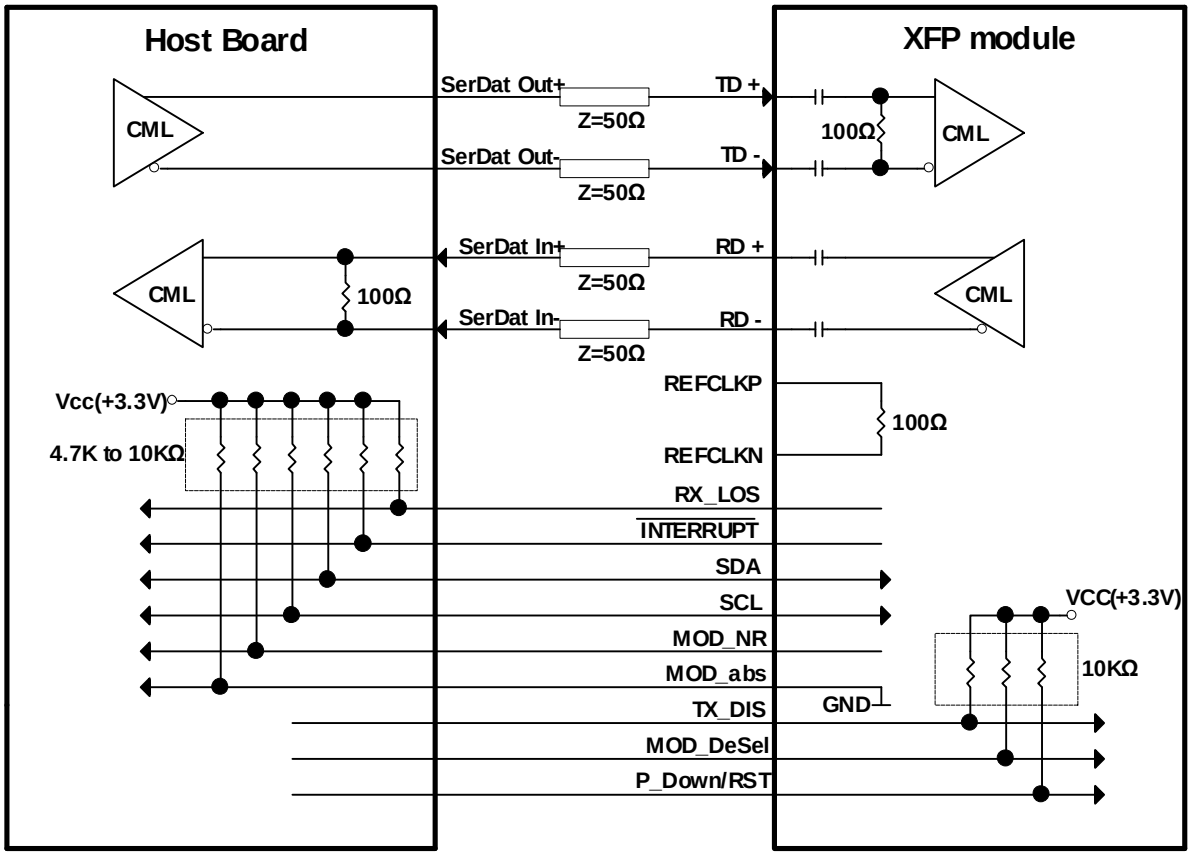


Table 2 Serial ID Memory Contents (Table 01h)

Address	Field Size (Byte)	Name of Filed	Description	Hex
128	1	Identifier	XFP	06
129	1	Ext. Identifier	power consumption < 3.5W, no Ref Clock required	90
130	1	Connector type	LC connector	07
131~138	8	Transceiver	800-SM-LL-L	00 00 00 00 00 00 00 00
139	1	Encoding	8B/10B, NRZ	50
140	1	BR-Min	1.063Gbps	0A
141	1	BR-Max	8.5Gbps	55
142	1	length (SMF)-Km	100	64
143	1	Length (E-50μm)	0 m	00
144	1	Length (50 μm)	0 m	00
145	1	Length (62.5 μm)	0 m	00
146	1	Length (Copper)	0 m	00
147	1	Device Tech	Cooled 1550 nm EML, APD detector	76
148~163	16	Vendor name	OPTOWAY	4F 50 54 4F 57 41 59 20 20 20 20 20 20 20 20 20
164	1	CDR Support	CDR supports 8.5G ~ 1.063G, XFI Loopback	01
165~167	3	Vendor OUI		00 0E FA
168~183	16	Vendor PN	XPS-43100WG	58 50 53 2D 34 33 31 30 30 57 47 20 20 20 20 20
184~185	2	Vendor rev	ASCII (“31 61” means 1a revision)	xx xx
186~187	2	Wavelength	1550 nm	79 18
188~189	2	Wavelength Tolerance	+/- 20nm	0F A0
190	1	Max Case Temp	70deg	46
191	1	CC_BASE	Check sum of Byte 128 -- 190	
192~195	4	Power Supply	3.5 Wmax, 1.5W pd_max , 750mA 3.3V, 500 mA 5V	AF 96 A8 00
196~211	16	Vendor SN	ASCII	xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx
212~219	8	Date code	ASCII Year (2 Byte), Month (2 Byte), Day (2 Byte)	xx xx xx xx xx xx 20 20
220	1	Diagnostic Monitoring Type	No BER Support, Average Power	08
221	1	Enhanced Options	Optional Soft TX_DISABLE implemented, Optional Soft P_down implemented	60
222	1	Aux Monitoring	AUX1 for Vcc3.	70
223	1	CC_EXT	Check sum of Byte 192 -- 222	
224~255	32	Vendor Specific		Reserved

Note: Specifications subject to change without notice.

Revision History

Version	Subject	Release Date
1.0	Initial datasheet	2008/8/1