



10G pluggable Transceiver Module
SLB1D8H-C***
DWDM XFP for 80km transmission

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Modification History

Rev.	Date	Originator	Comment
Draft 0.1	Sep.13.2005	T.Horio	
Draft 0.2	Nov.25.2005	T.Itou	Change of power consumption
Draft 0.3	Dec.21.2005	T.Itou	Revision of wavelength channel Number
Draft 0.4	Jan.20.2006	T.Itou	Revision of wavelength channel Number Additional Absolute maximum Ratings information
Draft 0.5	Mar.17.2006	T.Itou	Additional I2C information



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XFP Transceiver Module

SLB1D8H-C***

Preliminary

10G DWDM XFP LR Transceiver Module

Features ;

- Hot-pluggable XFP footprint
- Maximum link length is 80km
- Cooled 1550nm EML.
- Duplex LC connector
- Power dissipation <4.5W
- Built-in digital diagnostic functions
- Temperature range 0 to 70degC(Short term -5 to 75degC)

Application ;

- 80km ITU-T G959.1 P1L1-2D2
- DWDM for 100GHz

1. Block diagram

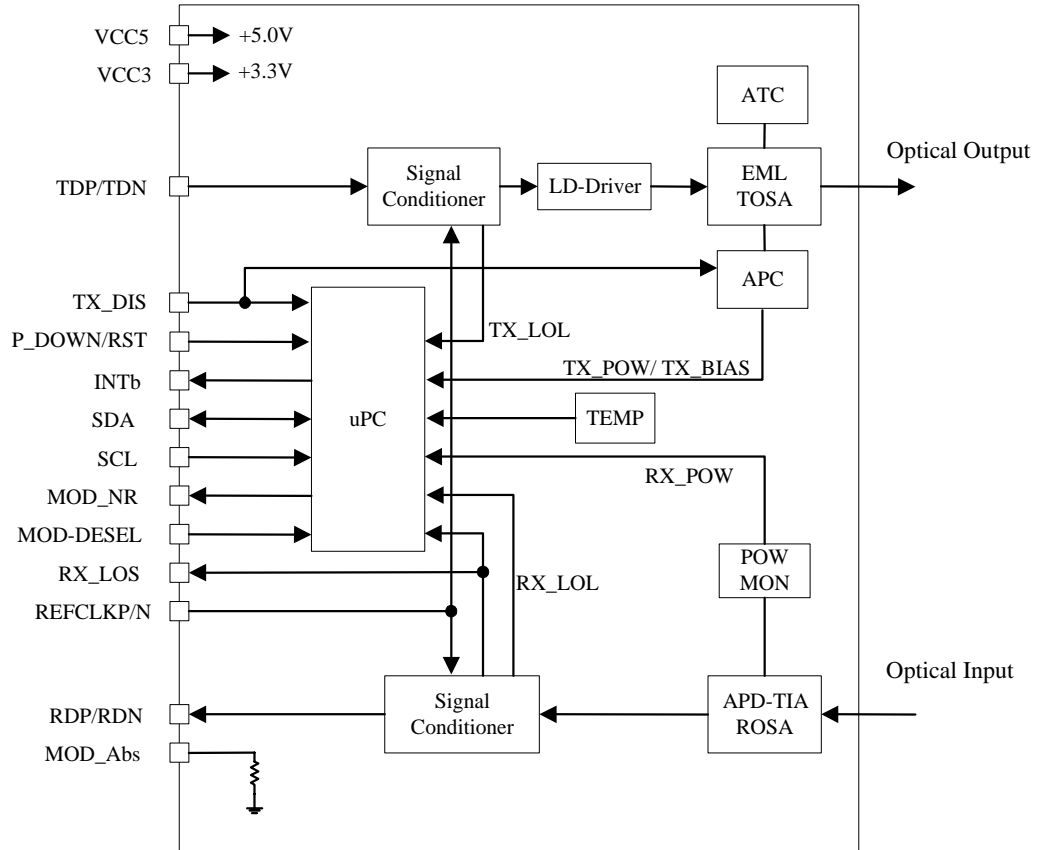


Figure 1 Block diagram



2. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	Note
Storage Temperature	Tst	-40	85	degC	
Relative Humidity	RH		85	%	
Short-term operating case temperature		-5	75	degC	
Supply Voltage	VCC5	0	6	V	
	VCC3	0	4	V	
Voltage on LVTTL Input		-0.3	VCC3+0.3	V	
Voltage on Open Collector Output		-0.3	3.6	V	
Optical Input Power	Pin_max		-5	dBm	

3. Operating Environment

Electrical and optical characteristics below are defined under this operating environment, unless otherwise specified.

Parameter	Symbol	Min	Max	Unit	Note
Supply Voltage	VCC5	4.75	5.25	V	
	VCC3	3.13	3.47	V	
Supply Current	ICC5		0.5	A	
	ICC3		0.75	A	
Power Dissipation	Pd		4.5	W	
Operating Case Temperature	Tc	0	70	degC	

4.Specifications

Optical interface specifications

Parameter	Symbol	Min	Max	Unit	Note
Transmitter					
Optical Output Power	P _{out}	0	+4	dBm	
Optical Wavelength	λ_c	See Table 4.1		nm	
Extinction Ratio	ER	9		dB	
Wavelength Stability			0.1	nm	
Side Mode suppression ratio	SMSR	30		dB	
Optical waveform		OC-192/STM-64 Unamplified Mask Standard			Figure 4.1
Receiver					
Minimum Sensitivity	P _{in}		-24	dBm	
Over load	P _{in}	-7		dBm	
Received wavelength	λ_{c_rx}	1260	1580	nm	
Jitter					
Jitter Generation			0.1	UI _{pp}	
Optical path					
Dispersion			1600	ps/nm	
Optical Path Penalty			2	dB	

Condition; Case temperature: 0 to 70degC, NRZ, PRBS²³¹-1, Mark ratio: 1/2,
Supply voltage: +3.3V, +5.0V each +/-5%

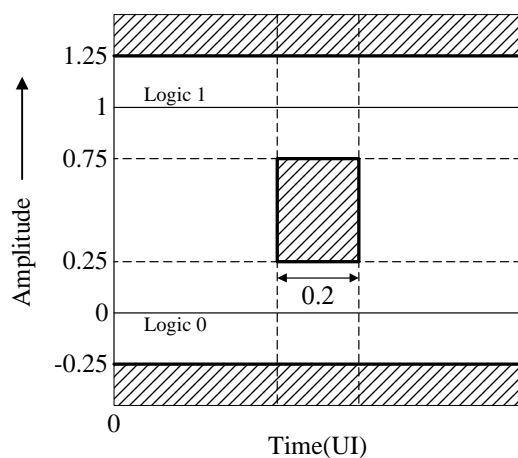


Figure 4.1 Eye pattern mask



Table 4.1 Optical Wavelength

λ [nm]	f [THz]	www :	λ [nm]	f [THz]	www :
1529.553	196.00	001	1546.917	193.80	023
1530.334	195.90	002	1547.715	193.70	024
1531.116	195.80	003	1548.515	193.60	025
1531.898	195.70	004	1549.315	193.50	026
1532.681	195.60	005	1550.116	193.40	027
1533.465	195.50	006	1550.918	193.30	028
1534.250	195.40	007	1551.721	193.20	029
1535.036	195.30	008	1552.524	193.10	030
1535.822	195.20	009	1553.329	193.00	031
1536.609	195.10	010	1554.134	192.90	032
1537.397	195.00	011	1554.940	192.80	033
1538.186	194.90	012	1555.747	192.70	034
1538.976	194.80	013	1556.555	192.60	035
1539.766	194.70	014	1557.363	192.50	036
1540.557	194.60	015	1558.173	192.40	037
1541.349	194.50	016	1558.983	192.30	038
1542.142	194.40	017	1559.794	192.20	039
1542.936	194.30	018	1560.606	192.10	040
1543.730	194.20	019	1561.419	192.00	041
1544.526	194.10	020	1562.233	191.90	042
1545.322	194.00	021	1563.047	191.80	043
1546.119	193.90	022			



5. Pin configuration

Table 5 Pin Assignments

Pin No.	Logic	I/O	Symbol	Function
1			GND	Module ground: Signal ground
2			VEE5	No Internal Connection
3	LVTTTL	O	MOD_DESEL	Module Deselect: When held low by host allows the module to respond to 2-wire serial interface commands
4	LVTTTL	O	INTb	INTb: Indicates the presence of an important condition that can be read over the two wire interface
5	LVTTTL	I	TX_DIS	Transmitter Disable: Turns off transmitter laser source
6			VCC5	+5V power supply
7			GND	Module ground: Signal ground
8			VCC3	+3.3V power supply
9			VCC3	+3.3V power supply
10	LVTTTL	I	SCA	Two wire interface clock
11	LVTTTL	I/O	SDA	Two wire interface data line
12	LVTTTL	O	Mod_Abs	Module Not ready or indicating module operational fault
13	LVTTTL	O	MOD_NR	Receiver loss of signal
14	LVTTTL	O	RX_LOS	Receiver loss of signal
15			GND	Module ground: Signal ground
16			GND	Module ground: Signal ground
17	CML	O	RD-	Receiver data output (Negative)
18	CML	O	RD+	Receiver data output (Positive)
19			GND	Module ground: Signal ground
20			VCC2	No Internal Connection
21	LVTTTL	I	P_DOWN/RST	Power down: In case of high, places the module in the low power standby mode of less than 1.5W with 2-wire interface still operational. Reset: The falling edge of P_Down/RST initiates a complete module reset including the 2-wire interface.
22			VCC2	No Internal Connection
23			GND	Module ground: Signal ground
24	PECL	I	RefCLK+	Reference clock input (Negative)
25	PECL	I	RefCLK-	Reference clock input (Positive)
26			GND	Module ground: Signal ground
27			GND	Module ground: Signal ground
28	CML	I	TD-	Transmitter data input (Negative)
29	CML	I	TD+	Transmitter data input (Positive)
30			GND	Module ground: Signal ground



6. Mechanical Information

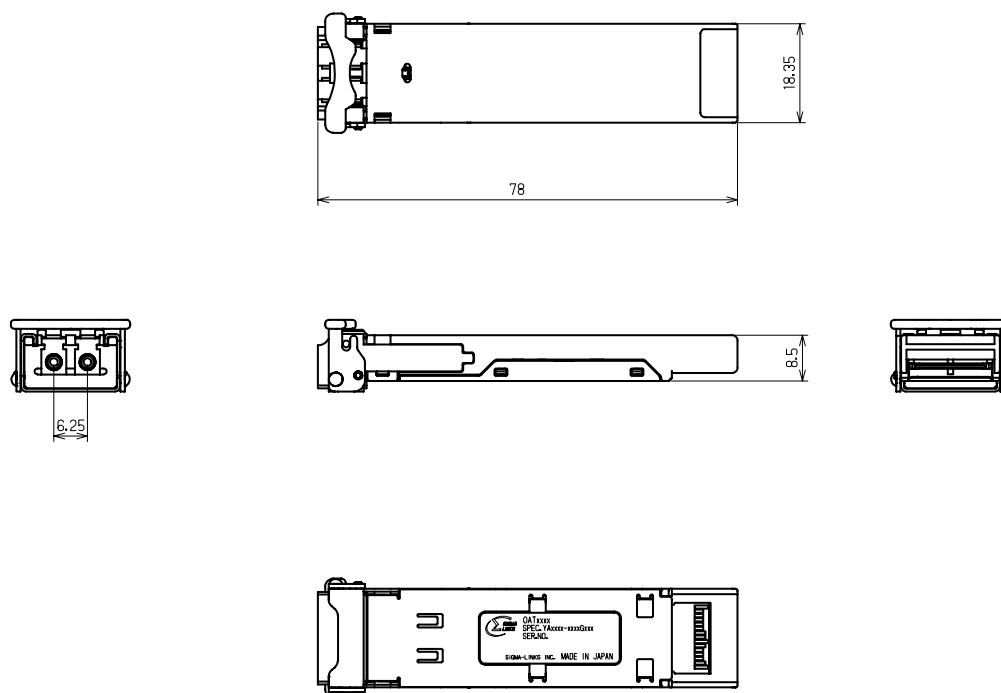


Figure 6 Package Outline (Units: mm)

7. Precautions for handling

Do not mount/pattern device/ circuits which generate high frequency noise close to the module.

In order to operate the module stable against the power noise, install the power supply noise reduction circuits.

The impedance between the power and ground pattern of the power circuit should be as low as possible. The elements around the module should be mounted close to the pins of the module.

If an optical power exceeding the absolute maximum ratings is fed to the module, the optical receiver may be damaged. Set the optical input power appropriately when in use of these modules.

8. Laser Safety

All version of transceiver are Class 1 Laser products FDA complies with 21 CFR 1040.10 and 1040.11 requirements. Also, all versions are Class 1 Laser products pre IEC 60825-1.



9. Management Interface

XFP 2-wire serial interface provide Digital Diagnostic and Serial ID Functions. The specification of the interface is based on **XFP MSA Rev.4.0**. Reference document of XFP MSA is available at <http://www.xfpmsa.org/>.

The protocol is described “CHAPTER 4: XFP 2-WIRE INTERFACE PROTOCOL”, and the memory map is described “CHAPTER 5: MANAGEMENT INTERFACE”.

This XFP transceiver module supports the functions as follows.

9.1 XFP 2-wire interface protocol

The basic I2C read/write functions are supported. But the communication mode with packet error checking protocol is **not** supported. (Correctly, Packet error checking protocol of this module is based on XFP MSA Rev.3.1 specification.)

9.2 Lower Memory Map

9.2.1 Identifier

This area is Read Only.

Table 9.2.1 Identifier

Address	Byte	Bit	Name	Description
0	1	ALL	Identifier Value	The value is "0x06" (meaning XFP)

9.2.2 Alarm and Warning Thresholds

This area is Read Only.

Table 9.2.2 Alarm and Warning Thresholds

Address	Byte	Bit	Name	Description
2-3	2	ALL	Temp High Alarm	High Temperature alarm threshold
4-5	2	ALL	Temp Low Alarm	Low Temperature alarm threshold
6-7	2	ALL	Temp High Warning	High Temperature warning threshold
8-9	2	ALL	Temp Low Warning	Low Temperature warning threshold
18-19	2	ALL	Bias High Alarm	High Laser Bias alarm threshold
20-21	2	ALL	Bias Low Alarm	Low Laser Bias alarm threshold
22-23	2	ALL	Bias High Warning	High Laser Bias warning threshold
24-25	2	ALL	Bias Low Warning	Low Laser Bias warning threshold
26-27	2	ALL	TX Power High Alarm	High Tx output Power alarm threshold
28-29	2	ALL	TX Power Low Alarm	Low Tx output Power alarm threshold
30-31	2	ALL	TX Power High Warning	High Tx output Power warning threshold
32-33	2	ALL	TX Power Low Warning	Low Tx output Power warning threshold
34-35	2	ALL	RX Power High Alarm	High Rx input Power alarm threshold
36-37	2	ALL	RX Power Low Alarm	Low Rx input Power alarm threshold
38-39	2	ALL	RX Power High Warning	High Rx input Power warning threshold
40-41	2	ALL	RX Power Low Warning	Low Rx input Power warning threshold

9.2.3 Latched Interrupt Flag

This area is Read Only.

Table 9.2.3 Latched Interrupt Flag Fields

Address	Byte	Bit	Name	Description
80	1	7	L- Temp High Alarm	Latched high Temperature alarm.
		6	L- Temp Low Alarm	Latched low Temperature alarm.
		5-4	Reserved	
		3	L- TX Bias High Alarm	Latched high TX Bias alarm.
		2	L- TX Bias Low Alarm	Latched low TX Bias alarm.
		1	L- TX Power High Alarm	Latched high TX Power alarm.
		0	L- TX Power Low Alarm	Latched low TX Power alarm.
81	1	7	L- RX Power High Alarm	Latched high RX Power alarm.
		6	L- RX Power Low Alarm	Latched low RX Power alarm.
		5-0	Reserved	
82	1	7	L- Temp High Warning	Latched high Temperature warning.
		6	L- Temp Low Warning	Latched low Temperature warning.
		5-4	Reserved	
		3	L- TX Bias High Warning	Latched high TX Bias warning.
		2	L- TX Bias Low Warning	Latched low TX Bias warning.
		1	L- TX Pow. High Warning	Latched high TX Power warning.
		0	L- TX Pow. Low Warning	Latched low TX Power warning.
83	1	7	L- RX Pow. High Warning	Latched high RX Power warning.
		6	L- RX Pow. Low Warning	Latched low RX Power warning.
		5-0	Reserved	
84	1	7	L- TX_NR	Latched TX_NR Status
		6	L- TX_Fault	Latched Laser Fault condition. Generated by laser safety system.
		5	L- TX CDR not Locked	Latched TX CDR Loss of Lock
		4	L- RX_NR	Latched RX_NR Status
		3	L- RX_LOS	Latched mirror of RX_LOS pin (Receiver loss of optical signal)
		2	L- RX CDR not Locked	Latched RX CDR Loss of Lock
		1	L- MOD_NR	Latched Mirror of MOD_NR pin
		0	L- Reset Complete	Latched Reset Complete Flag
85	1	7	L- APD Supply Fault	Latched APD Supply Fault
		6	L- TEC Fault	Latched TEC Fault
		5-0	Reserved	

9.2.4 Interrupt Masking Bits

This area is readable and writable.

Table 9.2.4 Interrupt Masking Bits

Address	Byte	Bit	Name	Description
88	1	7	M- Temp High Alarm	Masking bit for high Temperature alarm.
		6	M- Temp Low Alarm	Masking bit for low Temperature alarm.
		5-4	Reserved	
		3	M- TX Bias High Alarm	Masking bit for high TX Bias alarm.
		2	M- TX Bias Low Alarm	Masking bit for low TX Bias alarm.
		1	M- TX Power High Alarm	Masking bit for high TX Power alarm.
		0	M- TX Power Low Alarm	Masking bit for low TX Power alarm.
89	1	7	M- RX Power High Alarm	Masking bit for high RX Power alarm.



		6	M- RX Power Low Alarm	Masking bit for low RX Power alarm.
		5-0	Reserved	
90	1	7	M- Temp High Warning	Masking bit for high Temperature warning.
		6	M- Temp Low Warning	Masking bit for low Temperature warning.
		5-4	Reserved	
		3	M- TX Bias High Warning	Masking bit for high TX Bias warning.
		2	M- TX Bias Low Warning	Masking bit for low TX Bias warning.
		1	M- TX Pow. Hi Warning	Masking bit for high TX Power warning.
		0	M- TX Pow. Low Warning	Masking bit for low TX Power warning.
91	1	7	M- RX Pow. Hi Warning	Masking bit for high RX Power warning.
		6	M- RX Pow. Low Warning	Masking bit for low RX Power warning.
		5-0	Reserved	
92	1	7	M- TX_NR	Masking bit for TX_NR Status
		6	M- TX_Fault	Masking bit for Laser Fault condition.
		5	M- TX CDR not Locked	Masking bit for TX CDR Loss of Lock
		4	M- RX_NR	Masking bit for RX_NR Status
		3	M- RX_LOS	Masking bit for mirror of RX_LOS pin (Receiver optical loss of signal)
		2	M- RX CDR not Locked	Masking bit for RX CDR Loss of Lock
		1	M- MOD_NR	Masking bit for Mirror of MOD_NR pin
93	1	0	M- Reset Complete	Masking bit for Reset Complete Flag
		7	M- APD Supply Fault	Masking bit for APD Supply Fault
		6	M- TEC Fault	Masking bit for TEC Fault
		5-0	Reserved	

9.2.5 A/D Values

This area is Read Only.

Table 9.2.5 A/D Values

Address	Byte	Bit	Name	Description
96	2	All	Temperature MSB	Internally measured module temperature.
97			Temperature LSB	
100	2	All	TX Bias MSB	Internally measured TX Bias Current.
101			TX Bias LSB	
102	2	All	TX Power MSB	Measured TX output power.
103			TX Power LSB	
104	2	All	RX Power MSB	Measured RX input power.
105			RX Power LSB	



9.2.6 General control/status Bits

Table 9.2.6 General control/status

Address	Byte	Bit	Name	Description	r/w
110	1	7	TX Disable State	Digital state of the TX Disable Input Pin	r
		6	Soft TX Disable	00b = Enable laser (default) 01b = Software disable of laser	rw
		5	MOD_NR State	Digital state of the MOD_NR Pin	r
		4	P_Down State	Digital state of the P_Down Pin	r
		3	Reserved		
		2	Interrupt	Digital state of the Interrupt output pin	r
		1	RX_LOS	Indicates Optical Loss of Signal	r
		0	Data_Not_Ready	Indicates transceiver has achieved power up and A/D data is ready. Bit	r
111	1	7	TX_NR State	Identifies Not Ready condition as specific to the TX path	r
		6	TX_Fault State	Identifies Laser fault condition (Generated by laser safety system)	r
		5	TX_CDR not Locked	Identifies Loss of Lock in TX path CDR	r
		4	RX_NR State	Identifies Not Ready condition as specific to the TX path	r
		3	RX_CDR not Locked	Identifies Loss of Lock in RX path CDR	r
		2-0	Reserved		

9.2.8 Password and Table Select Entry Bytes

Host manufacturer password is initially set to 00h, 00h, 10h and 11h. It can be changed by writing a new password in Bytes 119-122 when the correct current Host manufacturer password has been entered in 123-126.

Table 9.2.8 Password and Table Select

Address	Byte	Bit	Name	Description
119-122	4	All	New Password Entry	Location of Entry of New Host Manufacturer Password
123-126	4	All	Password Entry	Location for Entry of Host Manufacturer Password
127	1	All	Table Select	Entry Location for Table Select Byte



9.3 Upper Memory Map Table 01H

Table 9.3.1 Serial ID : Data Fields

Address	Size (Bytes)	Name	Description
Base ID Fields			
128	1	Identifier	Type of serial transceiver
129	1	Ext. Identifier	Extended identifier of type of serial transceiver
130	1	Connector	Code for connector type
131-138	8	Transceiver	Code for electronic compatibility or optical compatibility
139	1	Encoding	Code for serial encoding algorithm
140	1	BR-Min	Minimum bit rate, units of 100 Mbits/s.
141	1	BR-Max	Maximum bit rate, units of 100 Mbits/s.
142	1	Length(SMF)-km	Link length supported for SMF fiber in km
143	1	Length (E-50mm)	Link length supported for EBW 50/125mm fiber, units of 2 m
144	1	Length (50 mm)	Link length supported for 50/125mm fiber, units of 1 m
145	1	Length (62.5 mm)	Link length supported for 62.5/125mm fiber, units of 1 m
146	1	Length (Copper)	Link length supported for copper, units of 1m
147	1	Device Tech	Device technology
148-163	16	Vendor name	XFP vendor name (ASCII)
164	1	CDR Support	CDR Rate Support
165-167	3	Vendor OUI	XFP vendor IEEE company ID
168	16	Vendor PN	Part number provided by XFP vendor (ASCII)
165-167	2	Vendor rev	Revision level for part number provided by vendor (ASCII)
168-183	2	Wavelength	Nominal laser wavelength (Wavelength = value / 20 in nm)
184-185	2	Wavelength Tolerance	Guaranteed range of laser wavelength (+/- value) from Nominal wavelength. (Wavelength Tol. = value/200 in nm)
186-187	1	Max Case Temp	Maximum Case Temperature in Degrees C.
191	1	CC_BASE	Check code for Base ID Fields (addresses 120-190)
Extended ID Fields			
192-195	4	Power Supply	Power supply current requirements and max power dissipation
196-211	16	Vendor SN	Serial number provided by vendor (ASCII)
212-219	8	Date code	Vendor's manufacturing date code
220	1	Diagnostic Monitoring Type	Indicates which type of diagnostic monitoring is implemented (if any) in the transceiver. Bit 1, 0 Reserved
221	1	Enhanced Options	Indicates which optional enhanced features are implemented (If any) in the transceiver
222	1	Aux Monitoring	Defines quantities reported by Aux. A/D channels
223	1	CC_EXT	Check code for the Extended ID Fields

9.4 Upper Memory Map Table 02H

Table 02h is provided as user writable EEPROM. The host can read this table at any time, and write when Host manufacturer password has been entered in 123-126.