

PRODUCT SPECIFICATION

FLXP-C5996-20D(I)

10Gb/s Duplex LC, SMF, CWDM DFB, PIN, 20km SFP+ Transceiver

■ Features:

- ★ Support multi-protocol from 8.5Gb/s to 11.3Gb/s
- ★ Hot-Pluggable SFP+ footprint
- ★ 1270~1450nm CWDM DFB laser transmitter
- ★ Duplex LC connector
- ★ Up to 20km on 9/125μm SMF
- ★ Single +3.3V Power Supply
- ★ Compliant with SFF-8431 SFF-8432 and IEEE802.3ae
- ★ Low power dissipation <1.5W typically
- ★ Industrial /Extended/ Commercial operating temperature range: -40°C to 85°C/-5°C to 85°C/-0°C to 70°C Version available
- ★ RoHS compliant



■ Applications:

- ★ 10GBASE-LR/LW Ethernet
- ★ 20km 10G Fiber channel
- ★ SONET OC-192/SDH STM-64
- ★ CWDM Networks

■ Description:

Flowlink FLXP-C5996-20D(I) transceivers are Enhanced Small Form Factor Pluggable SFP+ transceivers designed for use in 10-Gigabit multi-rate links up to 20km of G.652 single mode fiber. They are compliant with SFF-8431, SFF-8432 and 10GBASE ER/EW; support 4x, 8x and 10x Fibre Channel. Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472. Flowlink FLXP-C5996-20D(I) transceivers are RoHS compliant per Directive 2011/65/EU. The high performance cooled 1270~1450nm CWDM DFB transmitter and high sensitivity PIN receiver provide superior performance for Ethernet

applications at up to 20km links.

■ Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit
Storage Temperature	T _s	-40		+85	°C
Supply Voltage	V _{CC}	-0.5		4	V
Relative Humidity	RH	0		85	%
Industrial	TC	-40		85	°C
Commercial	TC	0		70	°C

■ Electrical Characteristics (T_{OP} = T_c, V_{CC} = 3.135 to 3.465 Volts)

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Supply Voltage	V _{CC}	3.14	3.30	3.47	V	
Supply Current	I _{CC}			350	mA	
Inrush Current	I _{surge}			I _{CC} +30	mA	
Maximum Power	P _{max}			1.5	W	
Transmitter Section:						
Input differential impedance	R _{in}		100		Ω	1
Tx Input Single Ended DC Voltage Tolerance (Ref V _{ee} T)	V	-0.3		4	V	
Single ended data input swing	V _{in PP}	180		700	mVp-p	2
Transmit Disable Voltage	V _D	2		V _{CC}	V	3
Transmit Enable Voltage	V _{EN}	V _{ee}		V _{ee} + 0.8	V	
Transmit Disable Assert Time	T _{dessert}			10	us	
Receiver Section:						
Rx Output Diff Voltage	V _O	300		850	mV	3
Data output rise time	t _r	30			ps	4
Data output fall time	t _f	30			ps	4
LOS Fault	V _{losfault}	2		V _{CC_host}	V	5
LOS Normal	V _{los norm}	V _{ee}		V _{ee} +0.8	V	5

Note:

1. Connected directly to TX data input pins. AC coupling from pins into laser driver IC.
2. Per SFF-8431 Rev 3.0
3. Into 100 ohms differential termination.
4. 20%~80%
5. LOS is an open collector output. Should be pulled up with 4.7k – 10kΩ on the host board. Normal operation

is logic 0; loss of signal is logic 1. Maximum pull-up voltage is 5.5V.

■ Optical Parameters($T_{OP} = T_c$, $V_{CC} = 3.135$ to 3.465 Volts)

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Transmitter Section:						
Optical Wavelength-End Of Life	λ_c	λ -6.5		λ +6.5	pm	
Spectral Width	λ			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Optical Output Power	P _{out}	-3		3	dBm	
Optical Power OMA	P _{OMA}				dBm	
Optical Rise/Fall Time	t _r / t _f			260	ps	
Laser Off Power	P _{off}			-30	dBm	
Extinction Ratio	ER	3.5			dB	
Transmitter Dispersion Penalty	TDP			3.2	dB	2
Relative Intensity Noise	RIN			-128	dB/Hz	3
Optical Return Loss Tolerance		20			dB	
Eye Mask for Optical Output	Compliant with IEEE802.3 z (class 1 laser safety)					
Receiver Section:						
Optical Input Wavelength	λ_c	λ -6.5		λ +6.5	nm	
Receiver Overload	P _{ol}	0.5			dBm	5
RX Sensitivity	Sen			-15	dBm	4
RX_LOS Assert	LOS _A	-28			dBm	
RX_LOS Deassert	LOS _D			-18	dBm	
RX_LOS Hysteresis	LOS _H	0.5	2	2.5	dB	
Receiver Reflectance	R _{rx}			-12	dB	

Note:

1. Average power figures are informative only, per IEEE802.3ae.
2. TWDP figure requires the host board to be SFF-8431 compliant. TWDP is calculated using the Matlab code provided in clause 68.6.6.2 of IEEE802.3ae.
3. 12dB reflection.
4. Conditions of stressed receiver tests per IEEE802.3ae. CSRS testing requires the host board to be SFF-8431 compliant.
5. Receiver overload specified in OMA and under the worst comprehensive stressed condition.

Pin Assignment

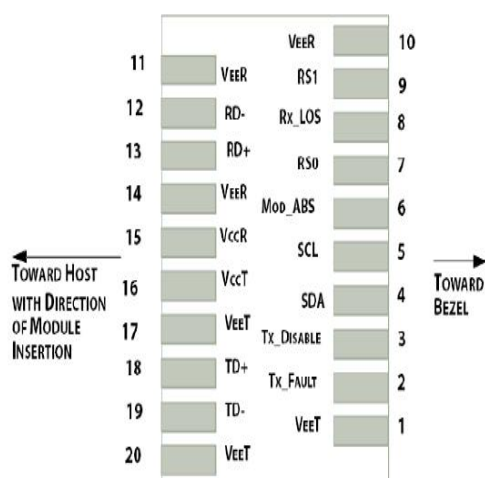


Figure2:Diagram of Host Board Connector Block Pin Numbers and Names

Pin Description

Pin No	Name	Function	Notes
1	VeeT	Transmitter Ground	1
2	TX Fault	Transmitter Fault Indication	2
3	TX Disable	Transmitter Disable	3
4	SDL	2 wire serial interface data input/output (SDA)	
5	SCL	2 wire serial interface clock input (SCL)	
6	MOD-ABS	Module Absent, connect to VeeR or VeeT in the module	2
7	RS0	Rate select0, optionally control SFP+ receiver. When high, input data rate >4.5Gb/ s; when low, input data rate <=4.5Gb/s	
8	LOS	Loss of Signal	4
9	RS1	Rate select0, optionally control SFP+ transmitter. When high, input data rate >4.5Gb/s; when low, input data rate <=4.5Gb/s	
10	VeeR	Receiver Ground	1
11	VeeR	Receiver Ground	1
12	RD-	Inv. Received Data Out	
13	RD+	Received Data Out	
14	VeeR	Receiver Ground	1
15	VccR	Receiver Power	
16	VccT	Transmitter Power	
17	VeeT	Transmitter Ground	1
18	TD+	Transmit Data In	
19	TD-	Inv. Transmit In	
20	VeeT	Transmitter Ground	1

Notes:

1. The module ground pins shall be isolated from the module case.
2. This pin is an open collector/drain output pin and shall be pulled up with 4.7K-10Kohms to Host_Vcc on the host board.
3. This pin shall be pulled up with 4.7K-10Kohms to VccT in the module.
4. This pin is an open collector/drain output pin and shall be pulled up with 4.7K-10Kohms to Host_Vcc on the host board.

■ SFP Module EEPROM Information and Management

The SFP modules implement the 2-wire serial communication protocol as defined in the SFP-8472. The serial ID information of the SFP modules and Digital Diagnostic Monitor parameters can be accessed through the I²C interface at address A0h and A2h. The memory is mapped in Table 1. Detailed ID information (A0h) is listed in Table 2. And the DDM specification is at address A2h. For more details of the memory map and byte definitions, please refer to the SFF-8472, “Digital Diagnostic Monitoring Interface for Optical Transceivers”. The DDM parameters have been internally calibrated.

Table 1. Digital Diagnostic Memory Map (Specific Data Field Descriptions)

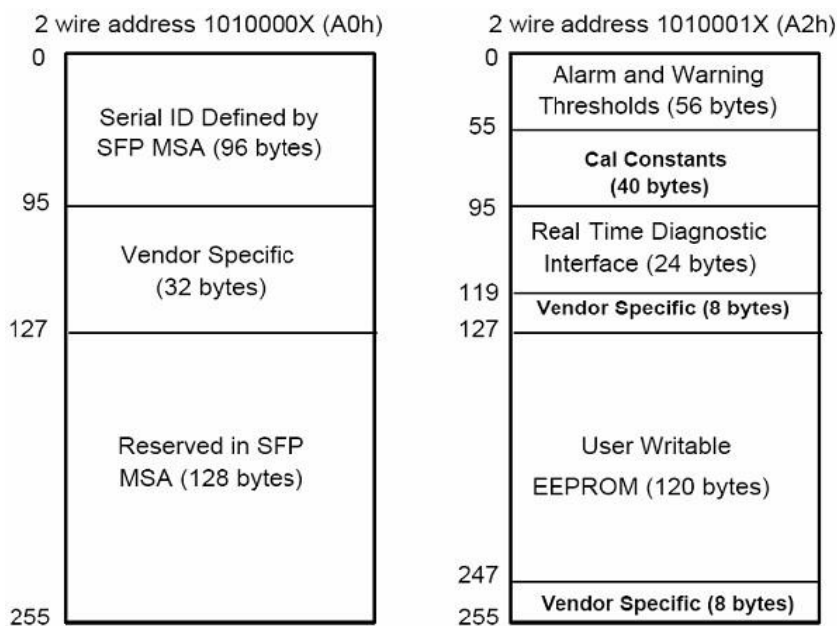


Table 2 - EEPROM Serial ID Memory Contents (A0h)

Data Address	Length (Byte)	Name of Length	Description and Contents
Base ID Fields			
0	1	Identifier	Type of Serial transceiver (03h=SFP)
1	1	Reserved	Extended identifier of type serial transceiver (04h)
2	1	Connector	Code of optical connector type (07=LC)
3-10	8	Transceiver	10G Base-LR
11	1	Encoding	64B/66B
12	1	BR,Nominal	Nominal baud rate, unit of 100Mbps
13	1	Reserved	(0000h)
14	1	Length(9um,km)	Link length supported for 9/125um fiber, units of km
15	1	Length(9um)	Link length supported for 9/125um fiber, units of 100m
16	1	Length(50um)	Link length supported for 50/125um fiber, units of 10m
17	1	Length(62.5um)	Link length supported for 62.5/125um fiber, units of 10m
18	1	Length(Copper)	Link length supported for copper, units of meters
19	1	Reserved	
20-35	16	Vendor Name	SFP vendor name:
36	1	Reserved	
37-39	3	Vendor OUI	SFP transceiver vendor OUI ID
40-55	16	Vendor PN	Part Number: "xxxxxxx" (ASCII)
56-59	4	Vendor rev	Revision level for part number
60-61	2	Wavelength	Laser wavelength
62	1	Reserved	
63	1	CCID	Least significant byte of sum of data in address 0-62
Extended ID Fields			
64-65	2	Option	Indicates which optical SFP signals are implemented(001Ah = LOS, TX_FAULT, TX_DISABLE all supported)
66	1	BR, max	Upper bit rate margin, units of %
67	1	BR, min	Lower bit rate margin, units of %
68-83	16	Vendor SN	Serial number (ASCII)
84-91	8	Date code	Manufacturing date code
92	1	Diagnostic Type	Diagnostics
93	1	Enhanced Options	Diagnostics
94	1	SFF-8472	Diagnostics
95	1	CCEX	Check code for the extended ID Fields (addresses 64 to 94)
Vendor Specific ID Fields			
96-127	32	Readable	Vendor specific date, read only
128-255	128	Reserved	Reserved for SFF-8079

■ Digital Diagnostic Monitor Characteristics

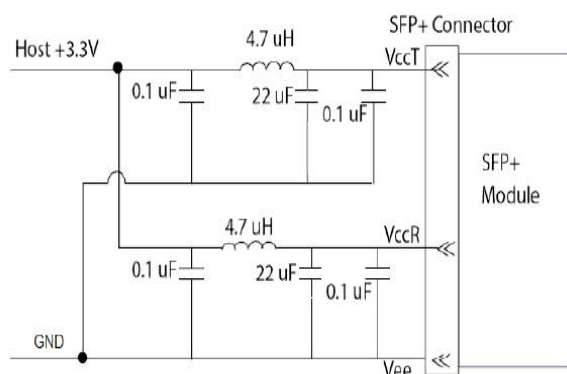
Data Address	Parameter	Accuracy	Unit	Calibration
96-97	Transceiver Internal Temperature	±3.0	°C	internal
98-99	VCC3 Internal Supply Voltage	±5.0	%	internal
100-101	Laser Bias Current	±10	%	internal
102-103	Tx Output Power	±3.0	dBm	internal
104-105	Rx Input Power	±3.0	dBm	internal

■ Regulatory Compliance

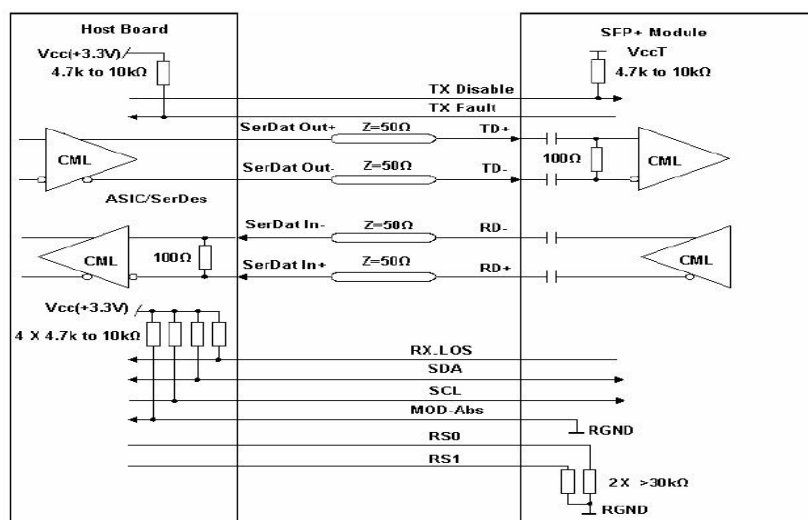
The transceiver complies with international Electromagnetic Compatibility (EMC) and international safety requirements and standards (see details in Table following).

Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 1(>1000 V)
Electrostatic Discharge (ESD) to the Duplex LC Receptacle	IEC 61000-4-2 GR-1089-CORE	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022 Class B (CISPR 22B) VCCI Class B	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2	Compatible with Class 1 laser product.

■ Recommended Circuit:

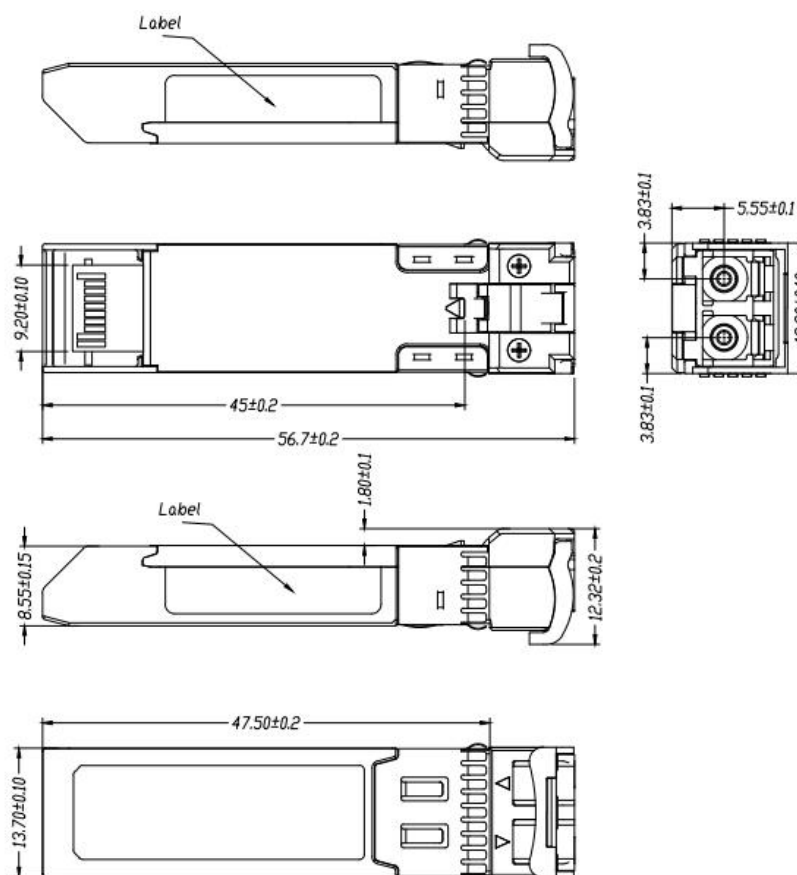


Recommended Host Board Power Supply Circuit



Recommended High-speed Interface Circuit

■ Mechanical Dimensions



Mechanical Drawing

Flowlink Technology Co., Ltd.

No:201, Building 7, Lian Jian Industrial Park, Hua Rong Road, Da Lang Street, Long Hua District, Shenzhen.

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