

TITLE: 1G SFP DWDM 120km Transceiver	DOC No.	DTRX-200718
	REVISION : 01	AUTHORIZED BY : Mike Sun
	DATE : 2021.08.04	CLASSIFICATION : Optical Transceiver

Features

- Supports 1.25 Gb/s bit rates
- Duplex LC connector
- Hot pluggable SFP+ footprint
- Cooled EML transmitter and APD receiver
- Applicable for 120km SMF connection
- Low power consumption, < 1.5W
- 100 GHz channel spacing
- Digital Diagnostic Monitor Interface
- Optical interface compliant to ITU-T 694.1& G.698.1
- Electrical interface compliant to SFF-8431& SFF-8432
- Operating case temperature: Industrial: 0 to 70°C / -40 to 85 °C



Applications

- 1.25G Ethernet
- ITU-T G.698.1
- Other optical links

PRODUCT NAME AND SERIES NUMBER(S)

1G SFP DWDM 120km Transceiver

Data Rate	Wavelength (nm)	Distance	Media	Power (dBm)	Sen. (dBm)	Connector	Tem.
1G	xxxxnm	120km	SMF	0 ~ +5	-32	LC	C
1G	xxxxnm	120km	SMF	0 ~ +5	-32	LC	I

Notes: Refer to the following table for wavelength.

PRODUCT SPECIFICATION

PAGE 2/10

TITLE: 1G SFP DWDM 120km Transceiver	DOC No. DTRX-200718	
	REVISION : 01	AUTHORIZED BY : Mike Sun
	DATE : 2021.08.04	CLASSIFICATION : Optical Transceiver

Wavelength (nm)	Wavelength (nm)	Wavelength (nm)	Wavelength (nm)	Wavelength (nm)
C17 (1563.86nm)	C18 (1563.05nm)	C19 (1562.23nm)	C20 (1561.41nm)	C21 (1560.61nm)
Wavelength (nm)	Wavelength (nm)	Wavelength (nm)	Wavelength (nm)	Wavelength (nm)
C22 (1559.79nm)	C23 (1558.98nm)	C24 (1558.17nm)	C25 (1557.36nm)	C26 (1556.55nm)
Wavelength (nm)	Wavelength (nm)	Wavelength (nm)	Wavelength (nm)	Wavelength (nm)
C27 (1555.75nm)	C28 (1554.94nm)	C29 (1554.13nm)	C30 (1553.33nm)	C31 (1552.52nm)
Wavelength (nm)	Wavelength (nm)	Wavelength (nm)	Wavelength (nm)	Wavelength (nm)
C32 (1551.72nm)	C33 (1550.92nm)	C34 (1550.12nm)	C35 (1549.32nm)	C36 (1548.51nm)
Wavelength (nm)	Wavelength (nm)	Wavelength (nm)	Wavelength (nm)	Wavelength (nm)
C37 (1547.72nm)	C38 (1546.92nm)	C39 (1546.12nm)	C40 (1545.32nm)	C41 (1544.53nm)
Wavelength (nm)	Wavelength (nm)	Wavelength (nm)	Wavelength (nm)	Wavelength (nm)
C42 (1543.73nm)	C43 (1542.94nm)	C44 (1542.14nm)	C45 (1541.35nm)	C46 (1540.56nm)
Wavelength (nm)	Wavelength (nm)	Wavelength (nm)	Wavelength (nm)	Wavelength (nm)
C47 (1539.77nm)	C48 (1538.98nm)	C49 (1538.19nm)	C50 (1537.40nm)	C51 (1536.61nm)
Wavelength (nm)	Wavelength (nm)	Wavelength (nm)	Wavelength (nm)	Wavelength (nm)
C52 (1535.82nm)	C53 (1535.04nm)	C54 (1534.25nm)	C55 (1533.47nm)	C56 (1532.68nm)
Wavelength (nm)	Wavelength (nm)	Wavelength (nm)	Wavelength (nm)	Wavelength (nm)
C57 (1531.90nm)	C58 (1531.12nm)	C59 (1530.33nm)	C60 (1529.55nm)	C61 (1528.77nm)

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Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Note
Supply Voltage	V _{CC}	-0.5	4.0	V	
Storage Temperature (C)	T _S	0	70	°C	C Temp.
Storage Temperature (I)	T _S	-40	85	°C	I Temp.
Relative Humidity	R _H	0	85	%	

Note: Stress in excess of the maximum absolute ratings can cause permanent damage to the transceiver.

General Operating Characteristics

Parameter	Symbol	Min.	Typ	Max.	Unit	Note
Data Rate	DR		1.25		Gb/s	
Supply Voltage	V _{CC}	3.13	3.3	3.47	V	
Supply Current	I _{CCS}			450	mA	
Operating Case Temp.	T _i	-40		85	°C	

Electrical Characteristics (T_{OP(I)} = -40 to 85 °C, V_{CC} = 3.13 to 3.47 V)

Parameter	Symbol	Min.	Typ	Max.	Unit	Note
Transmitter						
Differential data input swing	V _{IN,PP}	120		850	mV _{pp}	
Transmit Disable Voltage	V _D	V _{CC} -0.8		V _{CC}	V	
Transmit Enable Voltage	V _{EN}	V _{EE}		V _{EE} +0.8	V	
Input differential impedance	R _{in}		100		Ω	
Receiver						
Differential data output swing	V _{out,pp}	340		800	mV _{pp}	
Output rise time and fall time	T _r , T _f	28			Ps	1
LOS asserted	V _{LOS_F}	V _{CC} -0.8		V _{CC}	V	2
LOS de-asserted	V _{LOS_N}	V _{EE}		V _{EE} +0.8	V	2

Notes:

- 20 – 80%. Measured with Module Compliance Test Board and OMA test pattern. Use of four 1's and four 0's sequence in the PRBS 9 is an acceptable alternative.
- LOS is an open collector output. Should be pulled up with 4.7kΩ – 10kΩ on the host board. Normal operation is logic 0; loss of signal is logic 1.

JESS-LINK PRODUCTS CO., LTD
PRODUCT SPECIFICATION

PAGE 4/10

TITLE: 1G SFP DWDM 120km Transceiver	DOC No.	DTRX-200718
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Optical Characteristics

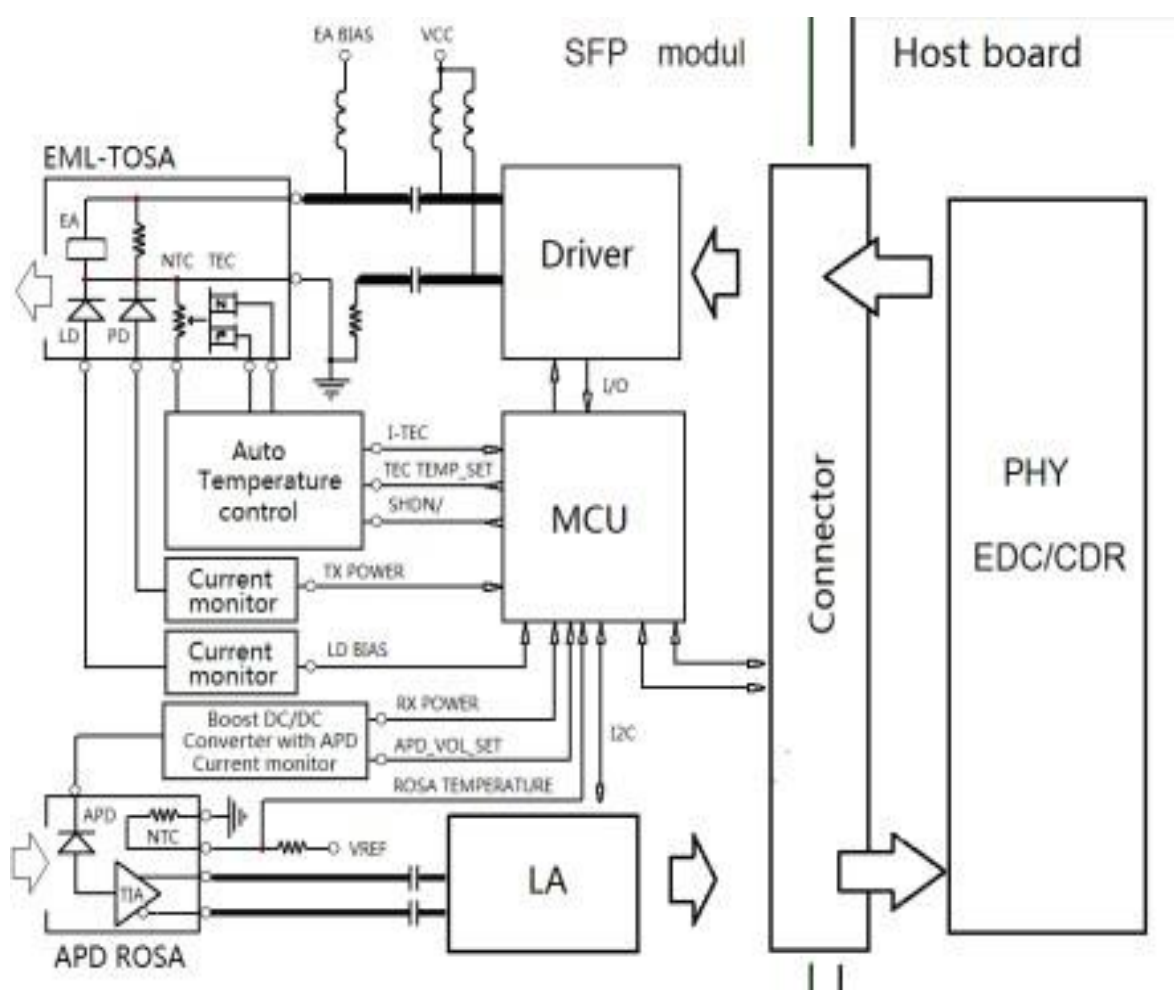
Parameter	Symbol	Min.	Typ	Max.	Unit	Note
Transmitter						
Center Wavelength	λ_c	$\lambda - 0.1\text{nm}$	λ	$\lambda + 0.1\text{nm}$	nm	
Center Wavelength (End of Life)	λ_{c_EOL}		$\lambda_c \pm 100\text{pm}$			
Ave. output power (Enabled)	P _{AVE}	0		5	dBm	1
Side-Mode Suppression Ratio	SMSR	30			dB	
Extinction Ratio	ER	8.2			dB	
RMS spectral width	$\Delta\lambda$			1	nm	
Rise/Fall time (20%~80%)	T _r /T _f			50	ps	
Relative Intensity Noise	R _{IN}			-128	dB/Hz	
Receiver						
Operating Wavelength	λ	1260		1600	nm	
Receiver Sensitivity	P _{SEN}			-32	dBm	2
Overload	P _{AVE}	-7			dBm	
LOS Assert	P _a	-45			dBm	
LOS De-assert	P _d			-33	dBm	
LOS Hysteresis	P _d -P _a	0.5			dB	

Note1: Measured 2^{23-1} PRBS at 1.25G

Note2: Measured with worst ER=8.2dB; 2^{23-1} PRBS at 1.25G

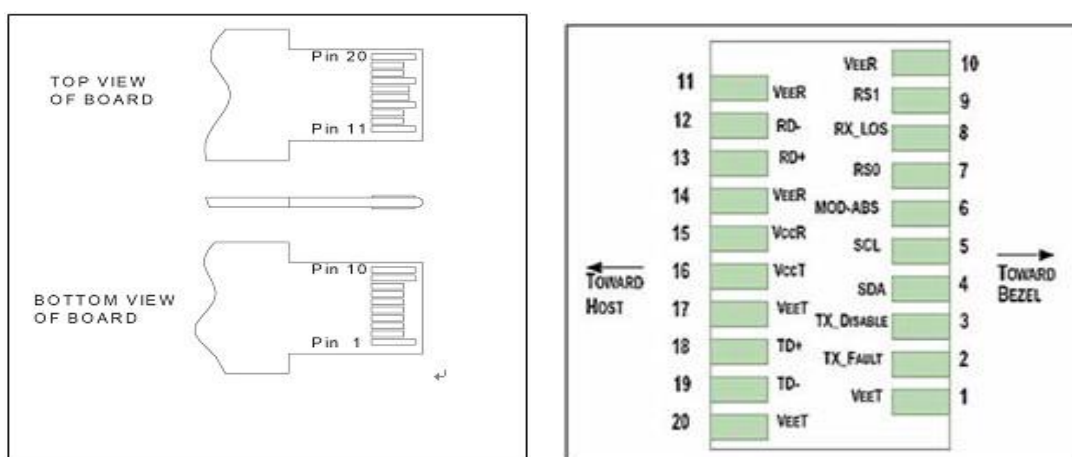
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Functional Diagram



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Pin Definition And Functions



Pin	Symbol	Name/Description
1	VEET [1]	Transmitter Ground
2	Tx_FAULT [2]	Transmitter Fault
3	Tx_DIS [3]	Transmitter Disable. Laser output disabled on high or open
4	SDA [2]	2-wire Serial Interface Data Line
5	SCL [2]	2-wire Serial Interface Clock Line
6	MOD_ABS [4]	Module Absent. Grounded within the module
7	RS0	Rate Select 0
8	RX_LOS [2]	Loss of Signal indication. Logic 0 indicates normal operation
9	RS1	Rate Select 1
10	VEER [1]	Receiver Ground
11	VEER [1]	Receiver Ground
12	RD-	Receiver Inverted DATA out. AC Coupled
13	RD+	Receiver DATA out. AC Coupled
14	VEER [1]	Receiver Ground
15	VCCR	Receiver Power Supply
16	VCCT	Transmitter Power Supply
17	VEET [1]	Transmitter Ground
18	TD+	Transmitter DATA in. AC Coupled
19	TD-	Transmitter Inverted DATA in. AC Coupled
20	VEET [1]	Transmitter Ground

PRODUCT SPECIFICATION**PAGE 7/10**

TITLE: 1G SFP DWDM 120km Transceiver	DOC No.	DTRX-200718
	REVISION : 01	AUTHORIZED BY : Mike Sun
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Notes:

- 1.Module circuit ground is isolated from module chassis ground within the module.
- 2.should be pulled up with 4.7k – 10k ohms on host board to a voltage between 3.15Vand 3.6V.
- 3.Tx_Disable is an input contact with a 4.7 k Ω to 10 k Ω pullup to VccT inside the module.
- 4.Mod_ABS is connected to VeeT or VeeR in the SFP+ module. The host may pull this contact up to Vcc_Host with a resistor in the range 4.7 k Ω to10 k Ω .Mod_ABS is asserted “High” when the SFP+ module is physically absent from a host slot.

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Serial Interface for ID and Digital Diagnostic Monitor

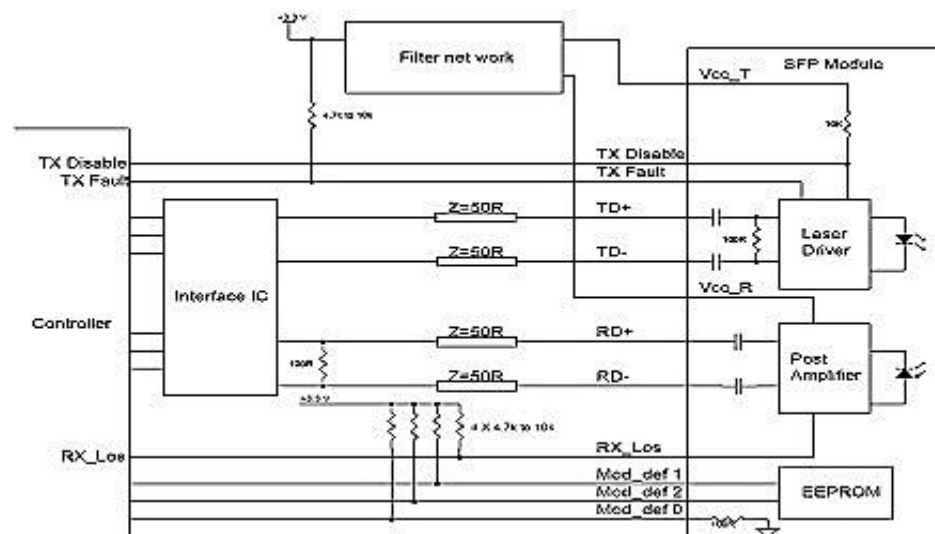
The transceiver support the 2-wire serial communication protocol as defined in the SFP MSA. The standard SFP serial ID provides access to identification information that describes the transceiver's capabilities, standard interfaces, manufacturer, and other information. Additionally, This SFP transceivers provide an enhanced digital diagnostic monitoring interface, which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage. It also defines a sophisticated system of alarm and warning flags, which alerts end-users when particular operating parameters are outside of a factory set normal range.

The SFP MSA defines a 256-byte memory map in EEPROM that is accessible over a 2-wire serial interface at the 8 bit address 1010000X(A0h), so the originally monitoring interface makes use of the 8 bit address(A2h), so the originally defined serial ID memory map remains unchanged. The structure of the memory map is shown in Table1.

2 wire address 1010000X (A0h)		2 wire address 1010001X (A2h)	
Address	Information	Address	Information
0~95	Serial ID Defined by SFP MSA (96 bytes)	0~55	Alarm and Warning Thresholds (56 bytes)
96~127	Vendor Specific (32 bytes)	56~95	Calibration Constants (40 bytes)
128~255	Reserved,SFF8079 (128 bytes)	96~119	Real Time Diagnostic Interface (24 bytes)
		120~127	Vender Specific (8 bytes)
		128~247	User Writable EEPROM (120 bytes)
		248~255	Vender Specific (8 bytes)

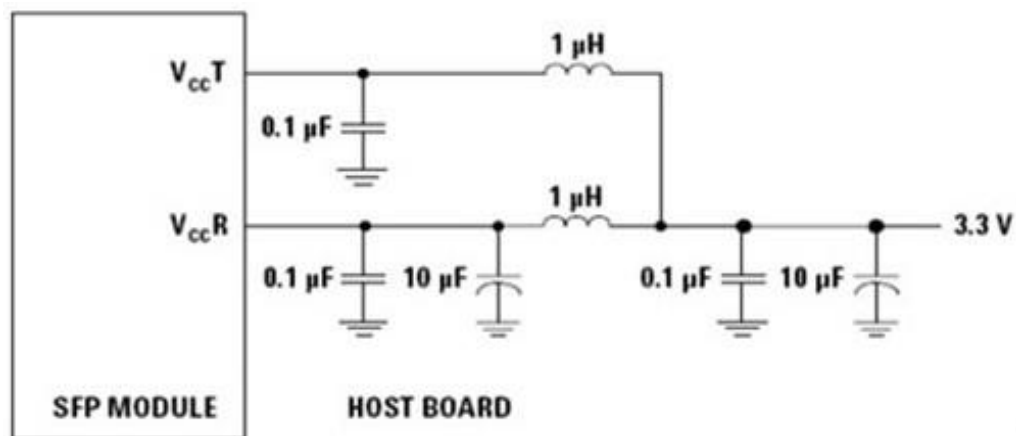
Table 1. Digital Diagnostic Memory Map (Specific Data Field Descriptions)

Typical Interface Circuit



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Recommended power supply filter



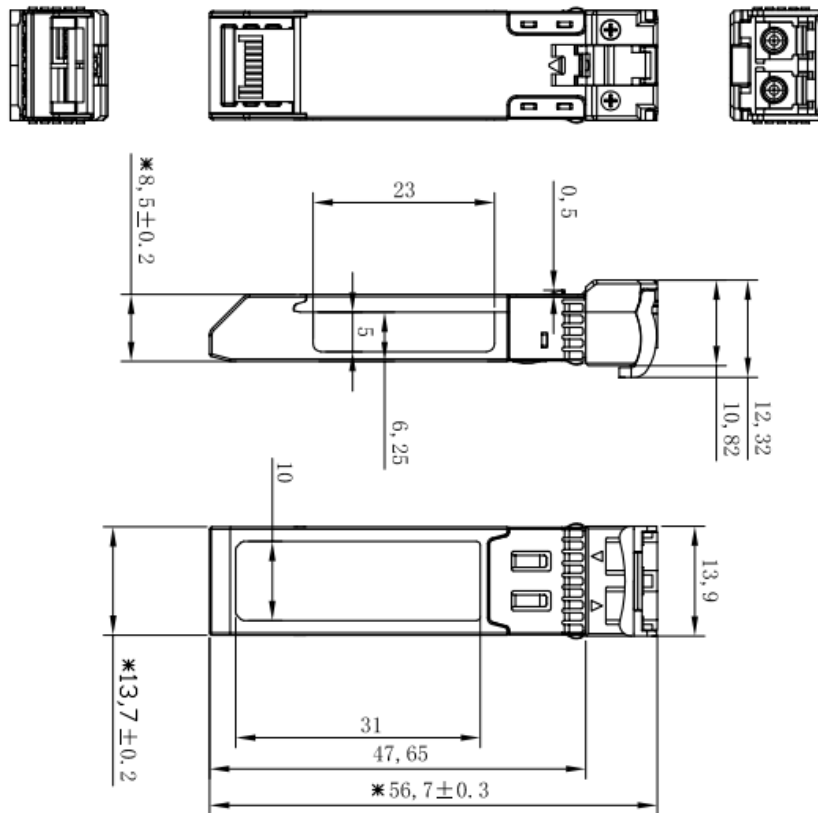
Note: Inductors with DC resistance of less than $1\ \Omega$ should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage. When the recommended supply filtering network is used, hot plugging of the SFP transceiver module will result in an inrush current of no more than 30 mA greater than the steady state value

JESS-LINK PRODUCTS CO., LTD
PRODUCT SPECIFICATION

PAGE 10/10

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Package Dimensions



Modification History

Rev.	Comments	Date	Originator	Approval
01	Preliminary Draft	2021.08.04	Mike Sun	Ray Yang