

SFP+-10G-DT-80**10Gb/s Tunable SFP+ Transceiver****Hot Pluggable, Duplex LC, +3.3V, 50GHz ITU Grid, Single mode, 80km, 0~70°C**

SFP+-10G-DT-80 tunable SFP+ Optical Transceiver provides a high-speed serial link at 9.95 to 11.3 Gbps data rates. It complies with SFP+ Multi-Source Agreement (MSA) Specification. It provides Digital diagnostics functions via a 2-wire serial interface as specified in SFF-8472. It fulfills the tunable via the monolithically Mach-Zehnder Modulators (MZM) laser. It support optical link up to 80km for SONET/SDH, 10G FC and Ethernet applications.

■ Features:

- ◇ Supports 9.95 to 11.3Gb/s bit rates
- ◇ Hot-Pluggable
- ◇ Duplex LC connector
- ◇ 50GHz ITU Grid, C Band
- ◇ Monolithic MZM Tunable transmitter, APD photo-detector
- ◇ SMF links up to 80km
- ◇ 2-wire interface for management specifications compliant with SFF 8472 digital diagnostic monitoring interface
- ◇ Power Supply :+3.3V
- ◇ Power consumption< 1.5W
- ◇ Temperature Range: 0~ 70°C
- ◇ RoHS compliant

■ Applications:

- ◇ 10GBASE-ZR/ZW Ethernet
- ◇ SONET OC-192 / SDH
- ◇ 10G Fibre channel
- ◇ DWDM Networks

■ Ordering Information:

Part Number	Data Rate	Distance	Wavelength	Laser	Fiber	DDM	Connector	Temperature
SFP+-10G-DT-80	10Gb/s	80km	50GHz DWDM C-band	EML/APD	SM	Yes	Duplex LC	0~ 70°C

■ Wavelength Reference Table

Channel	Central Wavelength	Frequency	Channel	Central Wavelength	Frequency	Channel	Central Wavelength	Frequency
200	1561.42nm	192.00THz	205	1561.01nm	192.05THz	210	1560.61nm	192.10THz
215	1560.20nm	192.15THz	220	1559.79nm	192.20THz	225	1559.39nm	192.25THz
230	1558.98nm	192.30THz	235	1558.58nm	192.35THz	240	1558.17nm	192.40THz
245	1557.77nm	192.45THz	250	1557.36nm	192.50THz	255	1556.96nm	192.55THz
260	1556.55nm	192.60THz	265	1556.15nm	192.65THz	270	1555.75nm	192.70THz

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Optical Transceiver Datasheet

275	1555.34nm	192.75THz	280	1554.94nm	192.80THz	285	1554.54nm	192.85THz
290	1554.13nm	192.90THz	295	1553.73nm	192.95THz	300	1553.33nm	193.00THz
305	1552.93nm	193.05THz	310	1552.52nm	193.10THz	315	1552.12nm	193.15THz
320	1551.72nm	193.20THz	325	1551.32nm	193.25THz	330	1550.92nm	193.30THz
335	1550.52nm	193.35THz	340	1550.12nm	193.40THz	345	1549.72nm	193.45THz
350	1549.32nm	193.50THz	355	1548.91nm	193.55THz	360	1548.51nm	193.60THz
365	1548.11nm	193.65THz	370	1547.72nm	193.70THz	375	1547.32nm	193.75THz
380	1546.92nm	193.80THz	385	1546.52nm	193.85THz	390	1546.12nm	193.90THz
395	1545.72nm	193.95THz	400	1545.32nm	194.00THz	405	1544.92nm	194.05THz
410	1544.53nm	194.10THz	415	1544.13nm	194.15THz	420	1543.73nm	194.20THz
425	1543.33nm	194.25THz	430	1542.94nm	194.30THz	435	1542.54nm	194.35THz
440	1542.14nm	194.40THz	445	1541.75nm	194.45THz	450	1541.35nm	194.50THz
455	1540.95nm	194.55THz	460	1540.56nm	194.60THz	465	1540.16nm	194.65THz
470	1539.77nm	194.70THz	475	1539.37nm	194.75THz	480	1538.98nm	194.80THz
485	1538.58nm	194.85THz	490	1538.19nm	194.90THz	495	1537.79nm	194.95THz
500	1537.40nm	195.00THz	505	1537.00nm	195.05THz	510	1536.61nm	195.10THz
515	1536.22nm	195.15THz	520	1535.82nm	195.20THz	525	1535.43nm	195.25THz
530	1535.04nm	195.30THz	535	1534.64nm	195.35THz	540	1534.25nm	195.40THz
545	1533.86nm	195.45THz	550	1533.47nm	195.50THz	555	1533.07nm	195.55THz
560	1532.68nm	195.60THz	565	1532.29nm	195.65THz	570	1531.90nm	195.70THz
575	1531.51nm	195.75THz	580	1531.12nm	195.80THz	585	1530.72nm	195.85THz
590	1530.33nm	195.90THz	595	1529.94nm	195.95THz			

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➤ **Absolute Maximum Ratings**

Parameter	Symbol	Min.	Typical	Max.	Unit
Storage Temperature	T_S	-40		+85	°C
Case Operating Temperature	T_A	0		70	°C
Maximum Supply Voltage	Vcc	-0.5		4	V
Relative Humidity	RH	0		85	%

➤ **Electrical Characteristics (TOP = 0 to 70 °C, VCC = 3.135 to 3.465 Volts)**

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Supply Voltage	Vcc	3.135		3.465	V	
Supply Current	Icc			450	mA	
Power Consumption	P			1.5	W	
Transmitter Section:						
Input differential impedance	R_{in}		100		Ω	1
Tx Input Single Ended DC Voltage Tolerance (Ref VeeT)	V	-0.3		4	V	
Differential input voltage swing	$V_{in,pp}$	180		700	mV	2
Transmit Disable Voltage	V_D	2		Vcc	V	3
Transmit Enable Voltage	V_{EN}	Vee		Vee+0.8	V	
Receiver Section:						
Single Ended Output Voltage Tolerance	V	-0.3		4	V	
Rx Output Diff Voltage	V_o	300		850	mV	
Rx Output Rise and Fall Time	T_r/T_f	30			ps	4
LOS Fault	$V_{LOS\ fault}$	2		V_{CC_HOST}	V	5
LOS Normal	$V_{LOS\ norm}$	Vee		Vee+0.8	V	5

Notes: 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 – 10k Ω 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} = 0 to 70°C, VCC = 3.135 to 3.465 Volts)**

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Transmitter Section:						
Wavelength range(ITU Grid)	Λ	1528.77		1563.86	nm	
Optical Wavelength-End Of Life	λ	X-100	X	X+100	pm	
Optical Wavelength-Beginning Of Life	λ	X-25	X	X+25	pm	
Average Optical Power	P_{avg}	0		+4	dBm	1
Laser Off Power	P_{off}			-30	dBm	
Extinction Ratio	ER	6			dB	
Transmitter Dispersion Penalty	TDP			3.0	dB	2
Relative Intensity Noise	Rin			-128	dB/Hz	3
Optical Return Loss Tolerance		20			dB	
Receiver Section:						
Center Wavelength	λ_r	1480		1580	nm	

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Receiver Sensitivity (OMA)	Sen			-23	dBm	4
Stressed Sensitivity (OMA)	Sen _{ST}			-21	dBm	4
Los Assert	LOS _A	-40		-	dBm	
Los Dessert	LOS _D			-24	dBm	
Los Hysteresis	LOS _H	0.5			dB	
Overload	Sat	-7			dBm	5
Receiver Reflectance	Rrx			-12	dB	

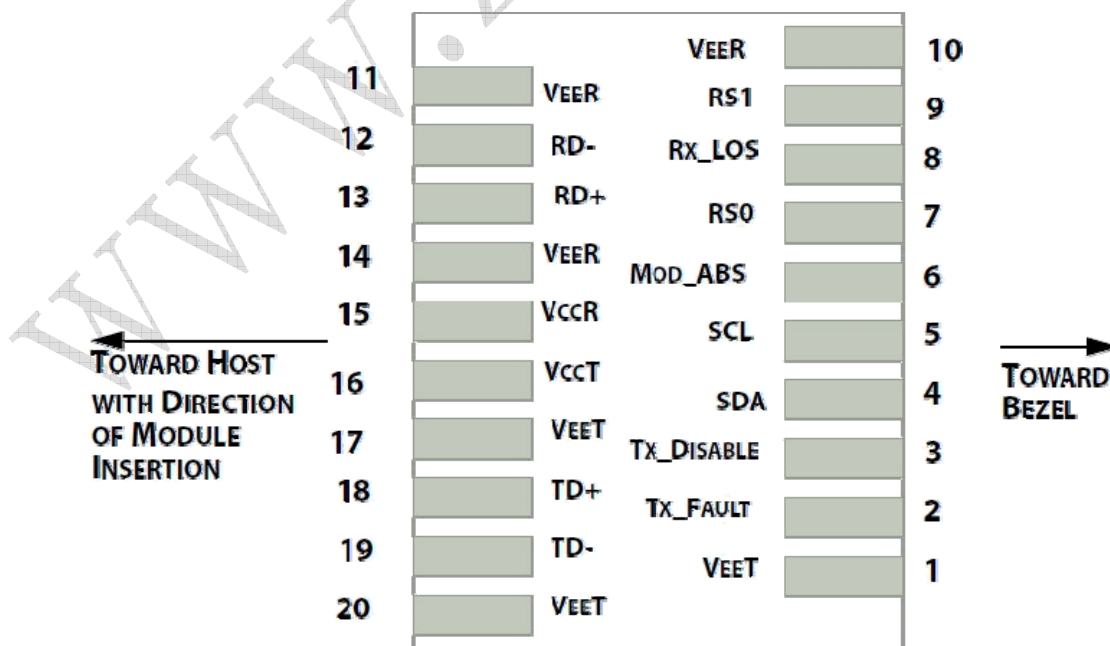
- Notes:
1. Average power figures are informative only, per IEEE802.3ae.
 2. TWDP figure requires the host board to be SFF-8431 compliant. TWDP is calculated using the Matlab code provided in clause 68.6.6.2 of IEEE802.3ae.
 3. 12dB reflection.
 4. Conditions of stressed receiver tests per IEEE802.3ae.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

➤ **Timing Characteristics**

Parameter	Symbol	Min.	Typical	Max.	Unit
TX_Disable Assert Time	t _{off}			10	us
TX_Disable Negate Time	t _{on}			1	ms
Time to Initialize Include Reset of TX_FAULT	t _{int}			300	ms
TX_FAULT from Fault to Assertion	t _{fault}			100	us
TX_Disable Time to Start Reset	t _{reset}	10			us
Receiver Loss of Signal Assert Time	T _{A,RX_LOS}			100	us
Receiver Loss of Signal Deassert Time	T _{D,RX_LOS}			100	us
Rate-Select Chage Time	t _{ratesel}			10	us
Serial ID Clock Time	t _{serial-clock}			100	kHz

➤ **Pin Assignment**

Diagram of Host Board Connector Block Pin Numbers and Name



➤ Pin Function Definitions

PIN	Name	Function	Notes
1	VeeT	Module transmitter ground	1
2	Tx Fault	Module transmitter fault	2
3	Tx Disable	Transmitter Disable; Turns off transmitter laser output	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	Receiver Loss of Signal Indication	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	Module receiver ground	1
11	VeeR	Module receiver ground	1
12	RD-	Receiver inverted data out put	
13	RD+	Receiver non-inverted data out put	
14	VeeR	Module receiver ground	1
15	VccR	Module receiver 3.3V supply	
16	VccT	Module transmitter 3.3V supply	
17	VeeT	Module transmitter ground	1
18	TD+	Transmitter inverted data out put	
19	TD-	Transmitter non-inverted data out put	
20	VeeT	Module transmitter ground	1

- Note:
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 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)

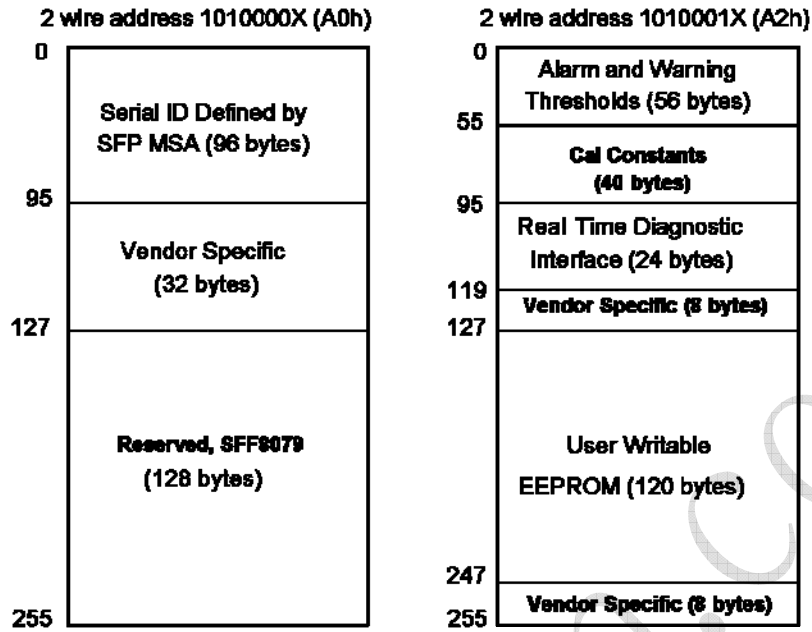


Table 2 - EEPROM Serial ID Memory Contents (A0h)

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-ZR
11	1	Encoding	64B/66B
12	1	BR, Nominal	Nominal baud rate, unit of 100Mbps
13-14	2	Reserved	(0000h)
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: SH Link
36	1	Reserved	
37-39	3	Vendor OUI	SFP transceiver vendor OUI ID
40-55	16	Vendor PN	Part Number: "SFP+-10G-DT-80" (ASCII)
56-59	4	Vendor rev	Revision level for part number
60-62	3	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	SH's Manufacturing date code
92-94	3	Reserved	
95	1	CCEX	Check code for the extended ID Fields (addresses 64 to 94)
Vendor Specific ID Fields			
96-127	32	Readable	SH specific date, read only
128-255	128	Reserved	Reserved for SFF-8079

➤ **Digital Diagnostic Monitor Characteristics**

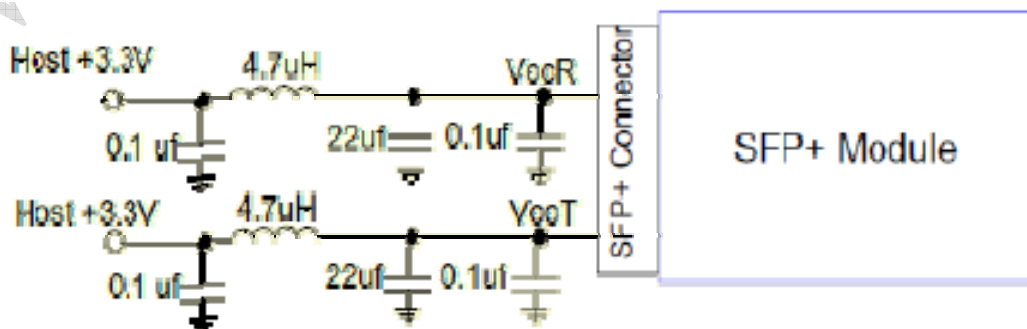
Data Address	Parameter	Accuracy	Unit
96-97	Transceiver Internal Temperature	±3.0	°C
100-101	Laser Bias Current	±10	%
100-101	Tx Output Power	±3.0	dBm
100-101	Rx Input Power	±3.0	dBm
100-101	VCC3 Internal Supply Voltage	±3.0	%

➤ **Regulatory Compliance**

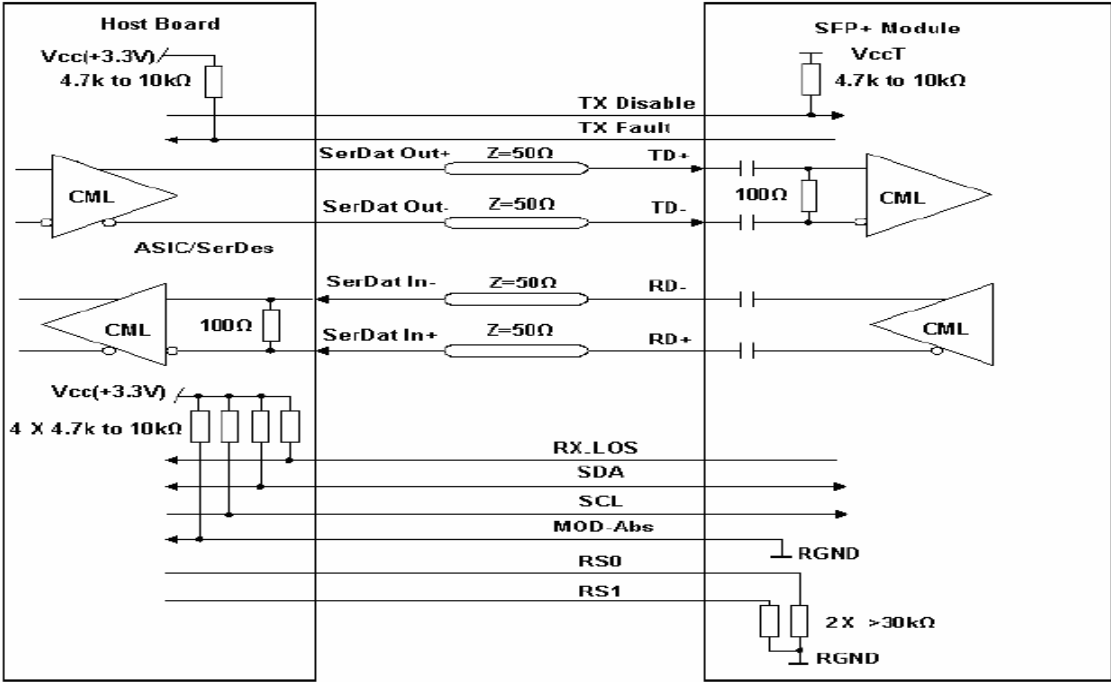
The SFP+-10G-DT-80 complies with international Electromagnetic Compatibility (EMC) and international safety requirements and standards (see details in Table following).

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

