

# 10Gb/s SFP+ DWDM C17-C61 80km Optical Transceiver

## Features

- Up to 80km on 9/125µm SMF
- Up to 11.3Gb/s data links
- DWDM EML transmitter and APD receiver
- Hot-pluggable SFP+ footprint
- Compliant with SFF+MSA and SFF-8472
- Duplex LC/UPC type pluggable optical interface
- RoHS-10 compliant and lead-free
- Support Digital Diagnostic Monitoring interface
- Hot pluggable
- Metal enclosure, for lower EMI
- Meet ESD requirements, resist 8KV direct contact voltage
- +3.3V power supply
- Operating case temperature: 0~+70°C

## Applications

- 10GBASE-ZR/ZW & 10G Ethernet
- SDH STM64
- Other Optical Links

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## Compliance

- Compliant with IEEE 802.3ae-2002
- Compliant with MSA SFF-8472
- Compliant with MSA SFF-8431

## Description

The SFP-10G-DW80 transceivers are designed for use in 10-Gigabit Ethernet links up to 80km over single mode fiber. The module consists of DWDM EML Laser, APD and Preamplifier in a high-integrated optical sub-assembly. Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472. This module is designed for single mode fiber and operates at a nominal wavelength of 100GHz ITU Grid, C Band DWDM wavelength.

SFP-10G-DW80 transceivers provide a unique enhanced digital diagnostic monitoring interface, which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, and 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). The digital diagnostic monitoring interface makes use of the 8 bit address 1010001X (A2h), so the originally defined serial ID memory map remains unchanged.

## Wavelength

Channel	Wavelength(nm)	Frequency (THZ)	Channel	Wavelength(nm)	Frequency (THZ)
C17	1563.86	191.70	C39	1546.12	193.90
C18	1563.05	191.80	C40	1545.32	194.00
C19	1562.23	191.90	C41	1544.53	194.10
C20	1561.42	192.00	C42	1543.73	194.20
C21	1560.61	192.10	C43	1542.94	194.30
C22	1559.79	192.20	C44	1542.41	194.40
C23	1558.98	192.30	C45	1541.35	194.50
C24	1558.17	192.40	C46	1540.56	194.60
C25	1557.36	192.50	C47	1539.77	194.70
C26	1556.55	192.60	C48	1538.98	194.80
C27	1555.75	192.70	C49	1538.19	194.90
C28	1554.94	192.80	C50	1537.40	195.00
C29	1554.13	192.90	C51	1536.61	195.10
C30	1553.33	193.00	C52	1535.82	195.20
C31	1552.52	193.10	C53	1535.04	195.30
C32	1551.72	193.20	C54	1534.25	195.40
C33	1550.92	193.30	C55	1533.47	195.50
C34	1550.12	193.40	C56	1532.68	195.60
C35	1549.32	193.50	C57	1531.90	195.70
C36	1548.51	193.60	C58	1531.12	195.80

C37	1547.72	193.70	C59	1530.33	195.90
C38	1546.92	193.80	C60	1529.55	196.00
Non-ITU	Peak wavelength between 1528.77nm-1563.86		C61	1528.77	196.10

## Absolute Maximum Ratings

**Table2-Absolute Maximum Ratings**

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T <sub>s</sub>	-40	+85	°C
Power Supply Voltage	V <sub>cc</sub>	-0.5	3.6	V
Relative Humidity (non-condensation)	RH	5	95	%
Damage Threshold	TH <sub>d</sub>	5		dBm

## Recommended Operating Conditions and Power Supply Requirements

**Table3-Recommended Operating Conditions and Power Supply Requirements**

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Operating Case Temperature	T <sub>op</sub>	0		+70	°C	
Power Supply Voltage	V <sub>CC</sub>	3.135	3.3	3.465	V	
Data Rate			10.3125		Gb/s	
Control Input Voltage High		2		V <sub>cc</sub>	V	
Control Input Voltage Low		0		0.8	V	
Link Distance (SMF)	D			80	km	9/125um

## Electrical Characteristics

**Table4-Electrical Characteristics**

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Power Consumption	p			1.5	W	
Supply Current	I <sub>cc</sub>			450	mA	
Transmitter						
Single-ended Input Voltage Tolerance	V <sub>cc</sub>	-0.3		4.0	V	
AC Common Mode Input Voltage Tolerance (RMS)		15			mV	
Differential Input Voltage Swing	V <sub>in,pp</sub>	120		820	mVpp	
Differential Input Impedance	Z <sub>in</sub>	90	100	110	Ohm	1
Transmit Disable Assert Time				10	us	
Transmit Disable Voltage	V <sub>dis</sub>	V <sub>cc</sub> -1.3		V <sub>cc</sub>	V	

Transmit Enable Voltage	Ven	Vee		Vee +0.8	V	2
<b>Receiver</b>						
Differential Output Voltage Swing	Vout,pp	350		850	mVpp	
Differential Output Impedance	Zout	90	100	110	Ohm	3
Data output rise/fall time	Tr/Tf	28			ps	4
LOS Assert Voltage	VlosH	Vcc-1.3		Vcc	V	5
LOS De-assert Voltage	VlosL	Vee		Vee +0.8	V	5
Power Supply Rejection	PSR	100			mVpp	6

Notes:

- [1] Connected directly to TX data input pins. AC coupled thereafter.
- [2] Or open circuit.
- [3] Input 100 ohms differential termination.
- [4] These are unfiltered 20-80% values.
- [5] Loss of Signal is LVTTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.
- [6] Receiver sensitivity is compliant with power supply sinusoidal modulation of 20 Hz to 1.5 MHz up to specified value applied through the recommended power supply filtering network.

## Optical Characteristics

<b>Table5-Optical Characteristics</b>						
Parameter	Symbol	Min.	Typical	Max.	Unit	Note
<b>Transmitter</b>						
Center Wavelength	$\lambda_c$	$\lambda -0.1$		$\lambda +0.1$	nm	1
Center Wavelength Spacing			100		GHz	
Optical Spectral Width	$\Delta \lambda$			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Average Optical Power	P <sub>AVG</sub>	0		5	dBm	2
Optical Extinction Ratio	ER	8.2			dB	
Transmitter and Dispersion Penalty	TDP			3.0	dB	
Transmitter OFF Output Power	POff			-30	dBm	
Transmitter Eye Mask	Compliant with IEEE802.3ae					
<b>Receiver</b>						
Center Wavelength	$\lambda_c$	1270		1610	nm	
Receiver Sensitivity (Average Power)	Sen.			-23	dBm	3
Input Saturation Power (overload)	Psat	-8			dBm	
LOS Assert	LOSA	-32			dBm	
LOS De-assert	LOSD			-26	dBm	
LOS Hysteresis	LOSH	0.5			dB	

Notes:

[1]  $\lambda_c$  refer to wavelength selection, and corresponds to approximately 0.8 nm.

[2] Class 1 Laser Safety per FDA/CDRH and IEC-825-1 regulations.

[3] Measured with Light source 1528.77~1563.86nm, ER=8.2dB; BER =  $<10^{-12}$  @10.3125Gbps, PRBS=2<sup>31</sup>-1 NRZ.

## Digital Diagnostic Functions

The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified. It is compliant to SFF-8472 Rev10.2 with internal calibration mode. For external calibration mode please contact our sales staff.

Parameter	Symbols	Min.	Max.	Unit	Notes
Temperature monitor absolute error	DMI_Temp	-3	3	degC	Over operating temp
Supply voltage monitor absolute error	DMI_VCC	-0.15	0.15	V	Full operating range
RX power monitor absolute error	DMI_RX	-3	3	dB	
Bias current monitor	DMI_bias	-10%	10%	mA	
TX power monitor absolute error	DMI_TX	-3	3	dB	

## Pin Description

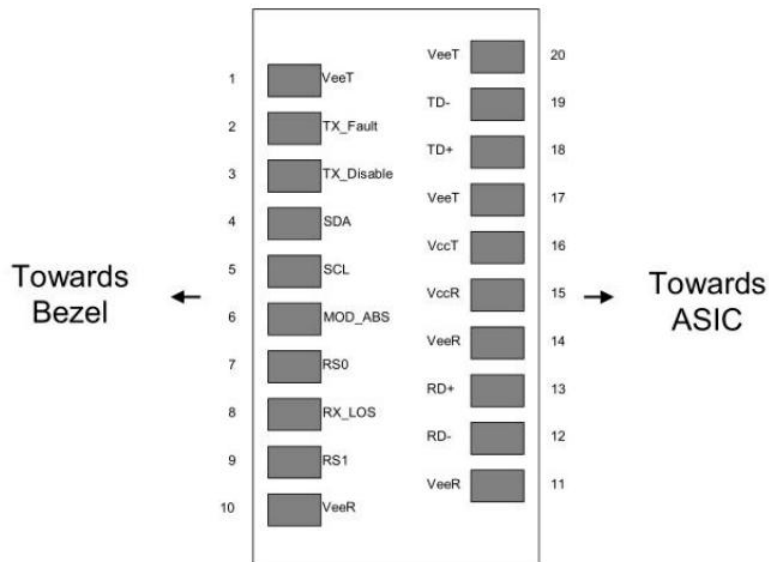


Figure1 Pin view

## Pin Function Definitions

Table7-Pin Function Definitions			
Pin	Symbol	Name/Description	Note
1	VeeT	Module Transmitter Ground	1
2	TX_Fault	Module Transmitter Fault	2
3	TX_Dis	Transmitter Disable. Laser output disabled on high or open	3
4	SDA	2-Wire Serial Interface Data Line	4
5	SCL	2-Wire Serial Interface Clock	4
6	MOD_ABS	Module Absent, connected to VeeT or VeeR in the module	4
7	RS0	Not used	5
8	RX_LOS	Receiver Loss of Signal Indication Active High	6
9	RS1	Not used	
10	VeeR	Module Receiver Ground	1
11	VeeR	Module Receiver Ground	1
12	RD-	Receiver Inverted Data Output	
13	RD+	Receiver Data Output	
14	VeeR	Module Receiver Ground	1
15	VccR	Module Receiver 3.3 V Supply	
16	VccT	Module Receiver 3.3 V Supply	
17	VeeT	Module Transmitter Ground	1
18	TD+	Transmitter Non-Inverted Data Input	
19	TD-	Transmitter Inverted Data Input	
20	VeeT	Module Transmitter Ground	1

### Notes:

[1] Circuit ground is internally isolated from chassis ground.

[2] TFAULT is an open collector/drain output, which should be pulled up with a 4.7k -10k Ohms resistor on the host board if intended for use. Pull up voltage should be between 2.0V to Vcc + 0.3V. A high output indicates a transmitter fault caused by either the TX bias current or the TX output power exceeding the preset alarm thresholds. A low output indicates normal operation. In the low state, the output is pulled to <0.8V.

[3] Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.

[4] Should be pulled up with 4.7kΩ-10kΩ on host board to a voltage between 2.0V and 3.6V. MOD\_ABS pulls line low to indicate module is plugged in.

[5] Internally pulled down per SFF-8431 Rev 4.1.

[6] LOS is open collector output. It should be pulled up with 4.7kΩ-10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

## Mechanical Dimensions

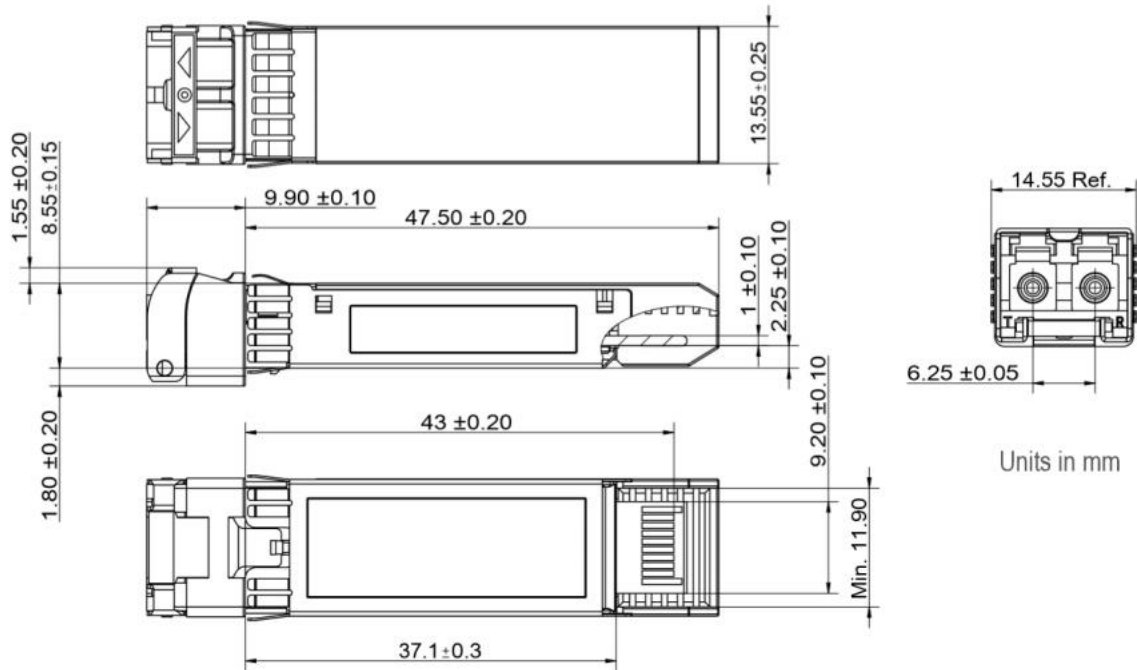


Figure2 Mechanical Outline

## Precautions

- a. This device is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.
- b. Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.

## Further Information:

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## Disclaimer

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