10Gb/s Tunable DWDM C17-C61 50GHz 80km SFP+ Optical Transceiver

Features

- Supports 9.95Gb/s to 11.3Gb/s bit rates
- 50 GHz ITU channel spacing with integrated wavelength locker
- Monolithically integrated full C-band tunable transmitter and APD receiver
- Up to 80km on 9/125μm SMF
- Hot-pluggable SFP+ footprint
- Duplex LC/UPC type pluggable optical interface
- RoHS-10 compliant and lead-free
- Support Digital Diagnostic Monitoring interface
- Metal enclosure, for lower EMI
- Specifications compliant with SFF-8472 V11.3& SFF-8690 V1.4
- +3.3V power supply
- Operating case temperature: 0~+70°C

Applications

- DWDM 10GBASE-ZR/ZW & 10G Ethernet
- DWDM SONET OC-192&SDH STM-64
- 10G Fiber Channel

Compliance

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

Description

The SFP-10G-DW80C tunable transceiver is an integrated fiber optic transceiver that provides a high-speed serial link at signaling rates from 9.95 Gb/s to 11.3 Gb/s. The module complies with the 10 Gigabit Enhanced Small Form Factor Pluggable （SFP+）multisource agreement-MSA（SFF- 8431） and SFF-8432，SFF-8690，SFF-8472. It complies with the ITU-T G.698.1 standard with 50 GHz channel spacing for SONET/SDH, IEEE DWDM 10GBASE-ZR for 80 km reach (Ethernet), and DWDM 10GFC for 80 km reach (Fiber Channel) applications.

SFP-10G-DW80C transceivers integrates the receiver and transmitter path on one module. The transceiver contain a C-band-tunable integrated Mach-Zehnder (MZ) laser, enabling data transmission over single-mode fiber through an industry-standard LC connector. On the receiver side, the 10 G/bps data stream is recovered from an APD/ trans-impedance amplifier, and passed to an output driver. This module features a hot-pluggable electrical interface.

The 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

Table1-Wavelength

Channel	Wavelength(nm)	Frequency (THZ)	Channel	Wavelength(nm)	Frequency (THZ)
C17	1563.86	191.70	C39	1546.12	193.90
H17	1563.45	191.75	H39	1545.72	193.95
C18	1563.05	191.80	C40	1545.32	194.00
H18	1562.64	191.85	H40	1544.92	194.05
C19	1562.23	191.90	C41	1544.53	194.10
H19	1561.83	191.95	H41	1544.13	194.15
C20	1561.42	192.00	C42	1543.73	194.20
H20	1561.01	192.05	H42	1543.33	194.25
C21	1560.61	192.10	C43	1542.94	194.30
H21	1560.20	192.15	H43	1542.54	194.35
C22	1559.79	192.20	C44	1542.41	194.40
H22	1559.39	192.25	H44	1541.75	194.45
C23	1558.98	192.30	C45	1541.35	194.50

H23	1558.58	192.35	H45	1540.95	194.55
C24	1558.17	192.40	C46	1540.56	194.60
H24	1557.77	192.45	H46	1540.16	194.65
C25	1557.36	192.50	C47	1539.77	194.70
H25	1556.96	192.55	H47	1539.37	194.75
C26	1556.55	192.60	C48	1538.98	194.80
H26	1556.15	192.65	H48	1538.58	194.85
C27	1555.75	192.70	C49	1538.19	194.90
H27	1555.34	192.75	H49	1537.79	194.95
C28	1554.94	192.80	C50	1537.40	195.00
H28	1554.54	192.85	H50	1537.00	195.05
C29	1554.13	192.90	C51	1536.61	195.10
H29	1553.73	192.95	H51	1536.22	195.15
C30	1553.33	193.00	C52	1535.82	195.20
H30	1552.93	193.05	H52	1535.43	195.25
C31	1552.52	193.10	C53	1535.04	195.30
H31	1552.12	193.15	H53	1534.64	195.35
C32	1551.72	193.20	C54	1534.25	195.40
H32	1551.32	193.25	H54	1533.86	195.45
C33	1550.92	193.30	C55	1533.47	195.50
H33	1550.32	193.35	H55	1533.07	195.55
C34	1550.12	193.40	C56	1532.68	195.60
H34	1549.72	193.45	H56	1532.29	195.65
C35	1549.32	193.50	C57	1531.90	195.70
H35	1548.91	193.55	H57	1531.51	195.75
C36	1548.51	193.60	C58	1531.12	195.80
H36	1548.11	193.65	H58	1530.72	195.85
C37	1547.72	193.70	C59	1530.33	195.90
H37	1547.32	193.75	H59	1529.94	195.95
C38	1546.92	193.80	C60	1529.55	196.00
H38	1546.52	193.85	H60	1529.16	196.05
Non-ITU	Peak wavelength between 1528.77nm-1563.86		C61	1528.77	196.10

Notes:

[1] When a tunable module is plugged in for the first time, it will go to a default channel, the transceiver default channel is 1568.36nm, compatible with channel range from 1 to 99.

[2] When the module is power cycled it will automatically go to the last channel selected, or when Tx _Disable asserted and then re-enabled, the module returns to the last channel selected.

Absolute Maximum Ratings

Table2-Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	Ts	-40	+85	℃
Power Supply Voltage	Vcc	-0.5	3.6	V
Relative Humidity (non-condensation)	RH	5	95	%
Damage Threshold	TH_d	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_{op}	0		+70	℃	
Power Supply Voltage	VCC	3.135	3.3	3.465	V	
Data Rate			10.3125		Gb/s	
Control Input Voltage High		2		Vcc	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	Icc			450	mA	
Transmitter						
Single-ended Input Voltage Tolerance	Vcc	-0.3		4.0	V	
AC Common Mode Input Voltage Tolerance (RMS)		15			mV	
Differential Input Voltage Swing	Vin,pp	240		910	mVpp	
Differential Input Impedance	Zin	90	100	110	Ohm	1
Transmit Disable Assert Time				10	us	
Transmit Disable Voltage	Vdis	Vcc-1.3		Vcc	V	
Transmit Enable Voltage	Ven	Vee		Vee +0.8	V	2
Receiver						
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	30			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 LVTTL. 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

Table5-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Transmitter						
Center Wavelength	λ_C	λ -0.05		λ +0.05	nm	1
Center Wavelength Spacing			50		GHz	
Optical Spectral Width	$\Delta\lambda$			1	nm	
Side Mode Suppression Ratio	SMSR	35			dB	
Average Optical Power	P_{AVG}	-1		4	dBm	2
Optical Extinction Ratio	ER	8.2			dB	
Transmitter and Dispersion Penalty	TDP			3.0	dB	
Transmitter OFF Output Power	POff			-30	dBm	
Frequency stability (BOL)		-1.5		1.5	GHz	
Frequency stability (EOL)		-1.5		2.5	GHz	
Transmitter Eye Mask	Compliant with IEEE802.3ae					
Receiver						
Center Wavelength	λ_C	1270		1610	nm	
Receiver Sensitivity (Average Power)	Sen.			-23	dBm	3
Input Saturation Power (overload)	Psat	-6			dBm	
LOS Assert	LOSA	-36			dBm	
LOS De-assert	LOSD			-27	dBm	
LOS Hysteresis	LOSH	0.5			dB	

Notes:

[1] λ c refer to wavelength selection, and corresponds to approximately 0.4 nm.

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

[3] Measured with Light source 1529.16~1568.36nm, ER=6.0dB; BER =<10^-12 @10.3125Gbps, PRBS=2^31-1 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.

Table6-Digital Diagnostic Functions

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

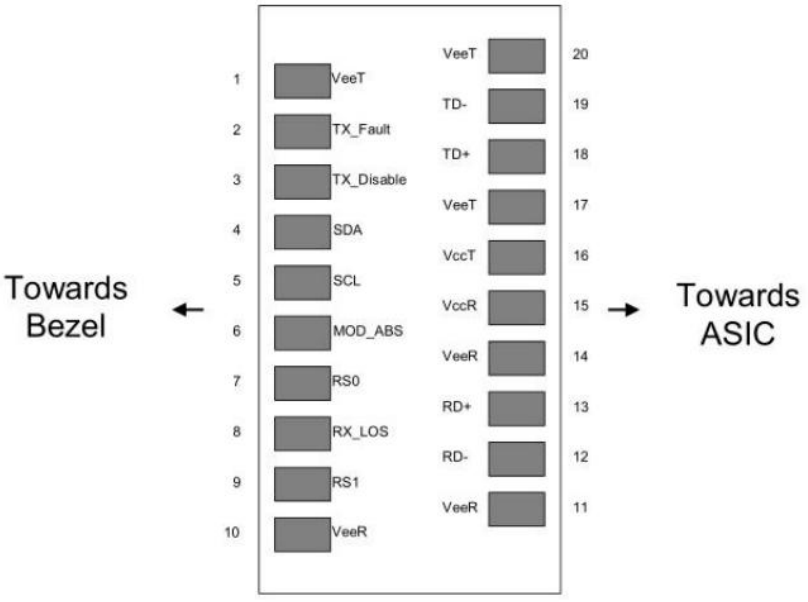

Figure1 Pin view

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

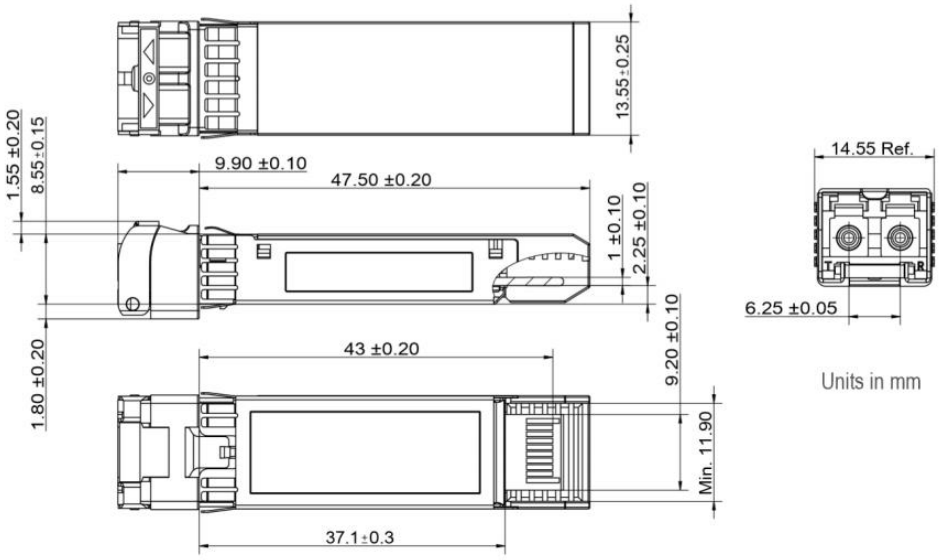

Figure2 Mechanical Outline

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

1. We are committed to continuous product improvement and feature upgrades, and the contents contained in this manual are subject to change without notice.

2. Nothing herein should be construed as constituting an additional warranty.

3. NADDOD assumes no responsibility for the use or reliability of equipment or software not provided by NADDOD.