Data Sheet

10G SFP+ DWDM 80KM Optical Transceivers with/ without CDR P/N: WST-SFP+DZRxx-C(R)

Applications:

- 10GBASE-ZR/ZW
- 80 km 10G Fiber Channel

Standard:

- Compliant to SFF-8431
- Compliant to SFF 8472
- RoHS Compliant.

Features：

- Up to 11.1Gbps Data Links
- Up to 80km transmission on SMF
- DWDM EML Laser and APD receiver
- Metal enclosure, for lower EMI
- 2-wire interface with integrated Digital Diagnostic monitoring
- Hot-pluggable SFP+ footprint
- Specifications compliant with SFF 8472
- Compliant with SFP+ MSA with LC connector
- Single 3.3V power supply
- Commercial/Industrial case operating temperature range: 0°C to 70°C /-40°C to 85°C
- Without CDR or with CDR supported 9.95 to 11.3Gb/s reference-free
- Low power dissipation：

  WST-SFP+DZRxx-C: 1.4W power dissipation without CDR for Commercial temperature

  WST-SFP+DZRxx-I: 1.6W power dissipation without CDR for Industrial temperature

  WST-SFP+DZRxx-CR: 1.5W power dissipation with CDR for Commercial temperature

  WST-SFP+DZRxx-IR: 1.7W power dissipation with CDR for Industrial temperature

Description

WaveSplitter's WST-SFP+DZRxx-x(R) serial SFP+ transceiver is 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 SFF8472. The module data link up to 80km in 9/125um single mode fiber.

Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Storage Temperature	Ts	-40	-	85	ºC	
Relative Humidity	RH	5	-	95	%	
Power Supply Voltage	VCC	-0.3	-	4	V	
Signal Input Voltage		Vcc-0.3	-	Vcc+0.3	V	

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Case Operating Temperature	Top	0	-	70	ºC	WST-SFP+DZRxx-C WST-SFP+DZRxx-CR
		-40		85		WST-SFP+DZRxx-I WST-SFP+DZRxx-IR
Power Supply Voltage	V_{CC}	3.14	3.3	3.47	V	
Data Rate	BR		10.3125		Gbps	
Transmission Distance	TD			80	km	
Coupled fiber	Single mode fiber					9/125um SMF

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Transmitter						
Average Launched Power	PO	-1		+4	dBm	Note (1)
Extinction Ratio	ER	8.2			dB	
Center Wavelength	λc	λc -0.1		λc +0.1	nm	Note (2)
Center Wavelength Spacing			100		GHz	Note (2)
Spectrum Band Width (-20dB)	σ			1.0	nm	
SMSR		30			dB	
Transmitter OFF Output Power	POff			-30	dBm	
Transmitter and Dispersion Penalty	TDP			3.0	dB	
Output Eye Mask	Compliant with IEEE 802.3ae					
Receiver						
Input Optical Wavelength	λ	1270		1610	nm	
Receiver Sensitivity	P_{sen}			-23.0	dBm	Note (3)
Input Saturation Power (Overload)	P_{sat}	-6.0			dBm	
Receiver Reflectance	R_{rx}			-27	dB	

LOS Assert	LOSA	-35			dBm	
LOS De-assert	LOSD			-26	dBm	
LOS Detect Hysteresis	P_{hys}	0.5			dB	

Notes:

1. Launched power (avg.) is power coupled into a single mode fiber with master connector. （Before of Life）
2. λc refer to wavelength selection and corresponds to approximately 0.8 nm.
3. Measured with conformance test signal for BER = 10^−12.@10.3125Gbps, PRBS=2^31-1,NRZ,Optical source with worst ER，Wavelength between 1528.77nm and 1563.86nm；back to back

Electrical Characteristics

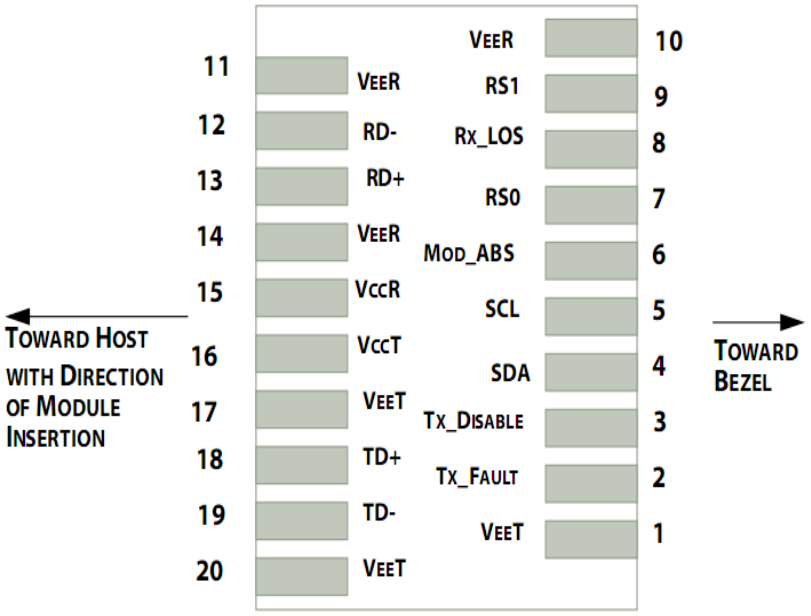
Parameter	Symbol	Min	Typ	Max	Unit	NOTE
Supply Voltage	Vcc	3.14	3.3	3.46	V	
Supply Current (Note 1)	Icc			430	mA	WST-SFP+DZRxx-C
				490		WST-SFP+DZRxx-I
				460		WST-SFP+DZRxx-CR
				520		WST-SFP+DZRxx-IR
Transmitter						
Input differential impedance	Rin		100		Ω	2
Single ended data input swing	Vin-pp	180		700	mV	
Transmit Disable Voltage	V_{Dis}	2.0		Vcc	V	3
Transmit Enable Voltage	V_{EN}	Vee		Vee+ 0.8	V	
Transmit Disable Assert Time				10	us	
Receiver						
Differential data output swing	Vout-pp	400		800	mV	4
Data output rise time	tr	28			ps	5
Data output fall time	tf	28			ps	5
LOS output high level	V_{LOS-H}	2.0		V_{CCHOST}	V	6
LOS output low level	V_{LOS-L}	Vee		Vee+0.8	V	6
Power Supply Rejection	PSR	100			mVpp	7

Notes:

1. Measured with receive Pin=Psen,Vcc=3.3V, operation temperature range, without air flow
2. Connected directly to TX data input pins. AC coupled.
3. Or open circuit.
4. Into 100 ohms differential termination.
5. 20 – 80 %.
6. Loss Of Signal is LVTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.

7. 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.

Pin Definition



Pin out of Connector Block on Host Board

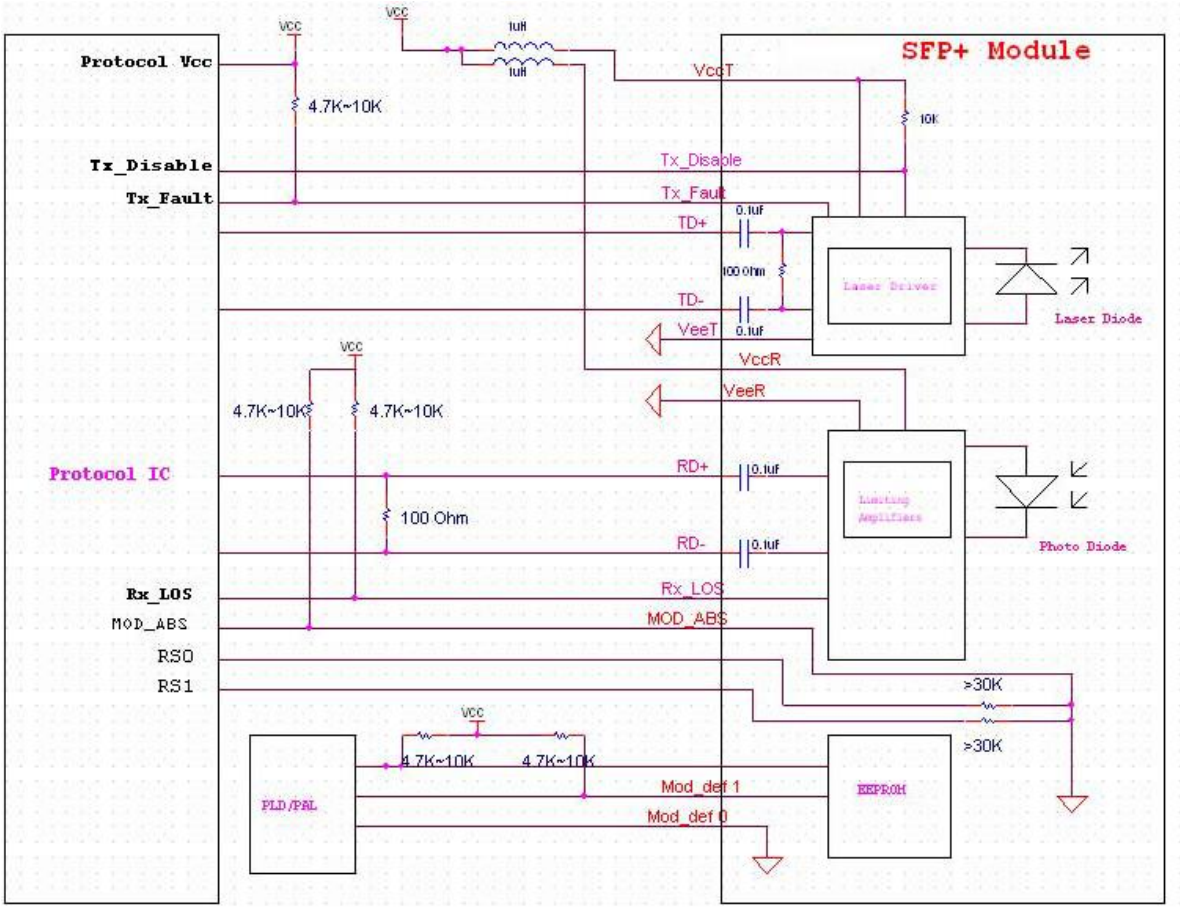
Pin	Symbol	Name/Description	NOTE
1	V_{EET}	Transmitter Ground (Common with Receiver Ground)	1
2	T_{FAULT}	Transmitter Fault.	2
3	T_{DIS}	Transmitter Disable. Laser output disabled on high or open.	3
4	SDA	2-wire Serial Interface Data Line	4
5	SCL	2-wire Serial Interface Clock Line	4
6	MOD_ABS	Module Absent. Grounded within the module	4
7	RS0	no connection	
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation.	5
9	RS1	Internally connect to circuit ground	1
10	V_{EER}	Receiver Ground (Common with Transmitter Ground)	1
11	V_{EER}	Receiver Ground (Common with Transmitter Ground)	1
12	RD-	Receiver Inverted DATA out. AC Coupled	
13	RD+	Receiver Non-inverted DATA out. AC Coupled	
14	V_{EER}	Receiver Ground (Common with Transmitter Ground)	1
15	V_{CCR}	Receiver Power Supply	

16	V_{CCT}	Transmitter Power Supply	
17	V_{EET}	Transmitter Ground (Common with Receiver Ground)	1
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	
19	TD-	Transmitter Inverted DATA in. AC Coupled.	
20	V_{EET}	Transmitter Ground (Common with Receiver Ground)	1

Notes:

1. Circuit ground is internally isolated from chassis ground.
2. T_{FAULT} is an LVTTL output. A high output indicates a transmitter fault caused by either the TX bias current or the TX output power or the laser temperature 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 T_{DIS} >2.0V or open, enabled on T_{DIS} <0.8V.
4. Should be pulled up with 4.7kΩ- 10kΩ on host board to a typical 3.3V voltage. MOD_ABS pulls low to indicate module is plugged in.
5. LOS is open collector output. It should be pulled up with 4.7kΩ – 10kΩ on host board to a typical 3.3V voltage. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

Recommended Interface Circuit



Serial ID Memory Contents

Data Address	Size (Bytes)	Name of Field	Contents (Hex)	Description
BASE ID FIELDS				
0	1	Identifier	03	SFP
1	1	Ext. Identifier	04	GBIC/SFP function is defined by two-wire interface ID only
2	1	Connector	07	LC Connector
3-10	8	Transceiver	80 00 00 00 00 00 00 00	10GBASE-ZR
11	1	Encoding	06	64B/66B
12	1	BR-Normal	67	10.3Gbps
13	1	Rate Identifier	00	Unspecified
14	1	Length (9um)-km	50	80km
15	1	Length (9um)	00	
16	1	Length (50um)	00	not support MMF
17	1	Length (62.5um)	00	not support MMF
18	1	Length (Copper)	00	not support copper
19	1	Length (OM3)	00	not support MMF
20-35	16	Vendor name	57 41 56 45 53 50 4C 49 54 54 45 52 20 20 20 20	WAVESPLITTER
36	1	Channel Spacing	00	
37-39	3	Vendor OUI	00 0F 0E	
40-55	16	Vendor PN	57 53 54 2D 53 46 50 2B 44 5A 52 xx xx 2D xx (xx)	WST-SFP+DZRxx-x(R)
56-59	4	Vendor rev	xx xx xx xx	
60-61	2	Wavelength	xx xx	DWDM Wavelength
62	1	DWDM Wavelength	xx	DWDM Wavelength
63	1	CC Base	xx	Check add. 0 to 62
64-65	2	Options	00 1A	TxDisable, TxFault, LOS implemented
66	1	BR,max	00	
67	1	BR,min	00	
68-83	16	Vendor SN	xxxxxxxxxxxxxxxx	
84-91	8	Data code	xxxxxxxxxxxxxxxx	
92	1	Diagnostic Monitoring Type	68	Internal cal., Average power
93	1	Enhanced Options	F0	Alarm/Warning flags, Soft TxDisable, Soft TxFault,
94	1	SFF-8472 Compliance	03	Rev. 10.0

95	1	CC_EXT	xx	Check add. 64 to 94
96-127	32	Vendor Specific		Vendor Specific EEPROM
128-255	128	Reserved	00	

Digital Diagnostic Functions

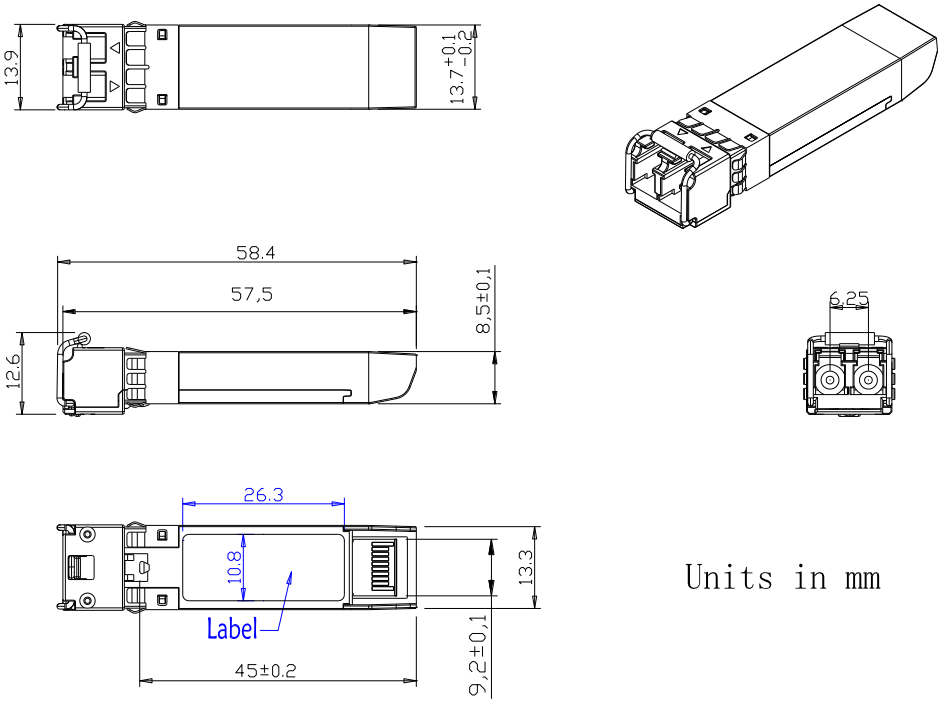
WaveSplitter's WST-SFP+DZRxx-x(R) serial transceivers support the 2-wire serial communication protocol as defined in the SFP+MSA. The standard SFP serial ID provides access to identification information that describes the transceiver's capabilities, standard interfaces, manufacturer, and other information.

Additionally, WaveSplitter SFP+ 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, 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.

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller (DDTC) inside the transceiver, which is accessed through a 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL, Mod Def 1) is generated by the host. The positive edge clocks data into the SFP transceiver into those segments of the E2PROM that are not write-protected. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA, Mod Def 2) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.

Mechanical



Regulatory Compliance

Feature	Reference	Performance
Electrostatic discharge（ESD）	IEC/EN 61000-4-2	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN 55022 Class B (CISPR 22A)	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10, 1040.11 IEC/EN 60825-1, 2	Class 1 laser product
Component Recognition	IEC/EN 60950, UL	Compatible with standards
ROHS	2002/95/EC	Compatible with standards
EMC	EN61000-3	Compatible with standards

Ordering Information

Part No	Specification									
	Package	Data rate	Laser	Optical Power	Detector	Sensitivity	Temp	Reach	Other	Application code
WST-SFP+DZRxx-C	SFP+	9.95Gbps ~11.3Gbps	DWDM EML	-1~ 4dBm	APD	-23dBm	0~70°C	80km	DDM RoHS without CDR	10GBASE-ZR/ZW
WST-SFP+DZRxx-I	SFP+	9.95Gbps ~11.3Gbps	DWDM EML	-1~ 4dBm	APD	-23dBm	-40~85°C	80km	DDM RoHS without CDR	10GBASE-ZR/ZW
WST-SFP+DZRxx-CR	SFP+	9.95Gbps ~11.3Gbps	DWDM EML	-1~ 4dBm	APD	-23dBm	0~70°C	80km	DDM RoHS with CDR	10GBASE-ZR/ZW
WST-SFP+DZRxx-IR	SFP+	9.95Gbps ~11.3Gbps	DWDM EML	-1~ 4dBm	APD	-23dBm	-40~85°C	80km	DDM RoHS with CDR	10GBASE-ZR/ZW

Note: xx= C-band λc Wavelength. Please refer to the below chart

C-band λc Wavelength Guide Pin Descriptions

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**	1542.14	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

Modification History

Revision	Date	Description	Originator	Review	Approved
V1	15-Nov-2011	New Issue	Min Liu	Wayne Liao	Wayne Liao
V1.1	26-May-2016	Revise some parameters	Min Liu	Wayne Liao	Wayne Liao
V2.0	25-Sep-2019	Renew	Ivy Chen	Min Liu	Min Liu

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