

### SPS-9380VW-DXX1RG

(RoHS Compliant)

### 100GHz DWDM / 3Gb/s Medium Power Optical SM Digital Diagnostic Transmitter/Receiver

#### FEATURES

- SMPTE 297-2006 Compatible
- Speed from 50 Mbps to 3Gbps
- Distance up to 80 km for 3G-SDI
- Support Video Pathological Patterns for SD-SDI, HD-SDI and 3G-SDI
- Single Transmitter with Simplex LC
- Single Receiver with Simplex LC
- Based on Industry Standard SFP
- SFF-8472 Digital Diagnostic Function
- Temperature-stabilized DWDM DML Transmitter
- 100 GHz ITU Grid, C Band
- 28 dB Power Budget at Least
- TTL Laser Disable Input
- TTL TX\_Fault Output
- TTL RX\_LOS Output
- Single +3.3 V Power Supply
- RoHS Compliant
- 0 to 70°C Operation
- Hot Pluggable
- Class 1 Laser International Safety Standard IEC-60825 Compliant

#### APPLICATIONS

- SMPTE 297-2006 Compliant Electrical-to-Optical Interfaces
- High-density Video Routers

#### DESCRIPTION

The SPS-9380VW-DXX1RG is a single mode transmitter/receiver module designed to transmit/receive optical serial digital signals as defined in SMPTE 297-2006. It supports from 50 Mbps to 3 Gbps and is specifically designed for transmitted the SMPTE 259M, SMPTE 344M, SMPTE 292M and SMPTE 424M SDI pathological patterns. It is with the SFP 20-pin connector to allow hot plug capability. Digital diagnostic functions are available via an I<sup>2</sup>C. This module is designed for single mode fiber and operates at a nominal wavelength of 100GHz ITU Grid, C Band DWDM wavelength. A guaranteed minimum optical link budget of 28 dB is offered. The transmitter can transmit signal from 50 Mbps to 3 Gbps with up to 80 km of single-mode fiber. A maximum distance of 80 km is achievable with 3Gbps pathological signals.

#### LASER SAFETY

This single mode transceiver is a Class 1 laser product. It complies with IEC-60825 and FDA 21 CFR 1040.10 and 1040.11. The transceiver must be operated within the specified temperature and voltage limits. The optical ports of the module shall be terminated with an optical connector or with a dust plug.

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**ORDER INFORMATION**

P/No.	Type	Bit Rate (Mb/s)	TX		RX		Package	Temp (°C)	RoHS Compliant
			λ (nm)	Power (dBm)	λ (nm)	Sen. (dBm)			
SPS-9380VW-DXX1RG	1-TX+1RX	50 to 3000	DWDM*	4 to 0	1260/1620	-9 to -28	LC SFP with DMI	0 to 70	Yes

\*XX: 100GHz ITU Grid wavelength (Please see below)

Channel #	Product code	Frequency (THz)	Center Wavelength (nm)	Label
20	SPS-9380VW-D201RG	192.0	1561.42	D20
21	SPS-9380VW-D211RG	192.1	1560.61	D21
22	SPS-9380VW-D221RG	192.2	1559.79	D22
23	SPS-9380VW-D231RG	192.3	1558.98	D23
24	SPS-9380VW-D241RG	192.4	1558.17	D24
25	SPS-9380VW-D251RG	192.5	1557.36	D25
26	SPS-9380VW-D261RG	192.6	1556.55	D26
27	SPS-9380VW-D271RG	192.7	1555.75	D27
28	SPS-9380VW-D281RG	192.8	1554.94	D28
29	SPS-9380VW-D291RG	192.9	1554.13	D29
30	SPS-9380VW-D301RG	193.0	1553.33	D30
31	SPS-9380VW-D311RG	193.1	1552.52	D31
32	SPS-9380VW-D321RG	193.2	1551.72	D32
33	SPS-9380VW-D331RG	193.3	1550.92	D33
34	SPS-9380VW-D341RG	193.4	1550.12	D34
35	SPS-9380VW-D351RG	193.5	1549.32	D35
36	SPS-9380VW-D361RG	193.6	1548.51	D36
37	SPS-9380VW-D371RG	193.7	1547.72	D37
38	SPS-9380VW-D381RG	193.8	1546.92	D38
39	SPS-9380VW-D391RG	193.9	1546.12	D39
40	SPS-9380VW-D401RG	194.0	1545.32	D40
41	SPS-9380VW-D411RG	194.1	1544.53	D41
42	SPS-9380VW-D421RG	194.2	1543.73	D42
43	SPS-9380VW-D431RG	194.3	1542.94	D43
44	SPS-9380VW-D441RG	194.4	1542.14	D44
45	SPS-9380VW-D451RG	194.5	1541.35	D45
46	SPS-9380VW-D461RG	194.6	1540.56	D46
47	SPS-9380VW-D471RG	194.7	1539.77	D47
48	SPS-9380VW-D481RG	194.8	1538.98	D48
49	SPS-9380VW-D491RG	194.9	1538.19	D49
50	SPS-9380VW-D501RG	195.0	1537.40	D50
51	SPS-9380VW-D511RG	195.1	1536.61	D51
52	SPS-9380VW-D521RG	195.2	1535.82	D52
53	SPS-9380VW-D531RG	195.3	1535.04	D53
54	SPS-9380VW-D541RG	195.4	1534.25	D54
55	SPS-9380VW-D551RG	195.5	1533.47	D55
56	SPS-9380VW-D561RG	195.6	1532.68	D56
57	SPS-9380VW-D571RG	195.7	1531.90	D57
58	SPS-9380VW-D581RG	195.8	1531.12	D58
59	SPS-9380VW-D591RG	195.9	1530.33	D59
60	SPS-9380VW-D601RG	196.0	1529.55	D60

### Absolute Maximum Ratings

Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Absolute Maximum Ratings					
Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature	Tstg	-40	85	°C	
Operating Case Temperature	Topr	0	70	°C	
Power Supply Voltage	Vcc	0	4	V	
ESD Tolerance on all pins			1	KV	HBM
Relative Humidity	RH	5	95	% RH	Non-condensing

Recommended Operating Conditions					
Parameter	Symbol	Min	Typ	Max	Units / Notes
Power Supply Voltage	Vcc	3.13	3.3	3.47	V
Operating Case Temperature	Topr	0		70	°C
Data Rate		50		3000	Mb/s
Power Supply Current	I <sub>CC(TX+RX)</sub>			430	mA

Transmitter Specifications (0°C < Tc < 70°C, 3.13V < Vcc < 3.47V)						
Parameter	Symbol	Min	Typ	Max	Units	Notes
<b>Optical</b>						
Average Launch Power	P <sub>O, AVG</sub>	0	---	4	dBm	1
Center Wavelength Spacing			100		GHz	2
Transmitter Center Wavelength -- over life time	λ <sub>c</sub>	X-100	X	X+100	pm	3
Output Spectrum Width	Δλ	---		1	nm	-20 dB width
Extinction Ratio	ER	5	7.5		dB	
Relative Intensity Noise	RIN			-120	dB/Hz	
Optical Rise Time / Fall Time	tr / tf			135	ps	4, SMPTE 424M
				270	ps	4, SMPTE 292M
				800	ps	4, SMPTE 344M
				1.5	ns	4, SMPTE 259M
<b>Electrical</b>						
Differential Input Voltage	V <sub>IH</sub> - V <sub>IL</sub>	200		800	mVp-p	AC coupled input
Disable Input Voltage -- Low	V <sub>TDIS,L</sub>	0		0.8	V	TX Output Enabled
Disable Input Voltage -- High	V <sub>TDIS,H</sub>	2.0		Vcc+0.3	V	TX Output Disabled
SCL, SDA	V <sub>OH</sub>	2.5		Vcc+0.3	V	
	V <sub>OL</sub>	0		0.5	V	

1. Output power is power coupled into a 9/125 μm single mode fiber.
2. Corresponds to approximately 0.8 nm.
3. X = specified ITU Grid wavelength
4. 20% to 80%, unfiltered.

Receiver Specifications (0°C < Tc < 70°C, 3.13V < Vcc < 3.47V)

Parameter	Symbol	Min	Typ	Max	Units	Notes
<b>Optical</b>						
Wavelength of Operation		1260	---	1620	nm	
Sensitivity for SMPTE 424M 2.97 Gb/s	Sen	-9	---	-28	dBm	Pathological
		-9		-28	dBm	PRBS 2 <sup>23</sup> -1, BER=1E-12
Sensitivity for SMPTE 292M 1.485 Gb/s	Sen	-9	---	-28	dBm	Pathological
		-9		-28	dBm	PRBS 2 <sup>23</sup> -1, BER=1E-12
Signal Detect -- Asserted	Pa	---	---	-28	dBm	Transition: low to high
Signal Detect -- Deasserted	Pd	-40	---	---	dBm	Transition: high to low
Signal detect -- Hysteresis		1		6	dB	
Optical Return Loss			-27		dB	
<b>Electrical</b>						
CML Output (Differential)		550	660	850	mVp-p	AC coupled output
Optical Rise Time / Fall Time	tr / tf			135	ps	5, SMPTE 424M
				270	ps	5, SMPTE 292M
				800	ps	5, SMPTE 344M
				1.5	ns	5, SMPTE 259M
Output LOS Voltage -- Low	V <sub>OL</sub>	0		0.5	V	I <sub>OL</sub> =-1.6mA, 1 TTL unit load
Output LOS Voltage -- High	V <sub>OH</sub>	2.5		V <sub>CC</sub> +0.3	V	I <sub>OH</sub> =40μA, 1 TTL unit load
SCL, SDA	V <sub>OH</sub>	2.5		V <sub>CC</sub> +0.3	V	
	V <sub>OL</sub>	0		0.5	V	

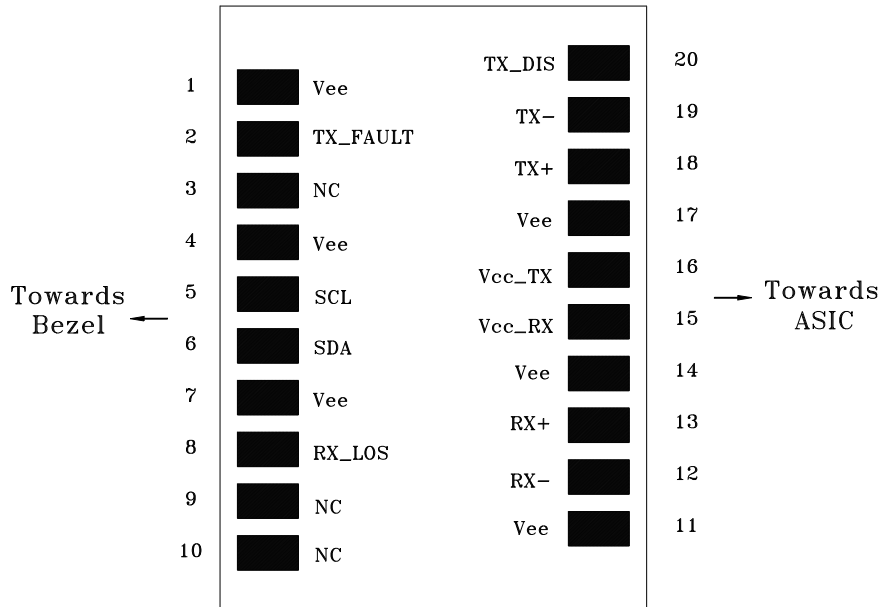
5. 20% to 80%, unfiltered.

### MODULE DEFINITION

Module Definition	PIN 5	PIN 6	Interpretation by Host
4	SCL	SDA	Serial module definition protocol

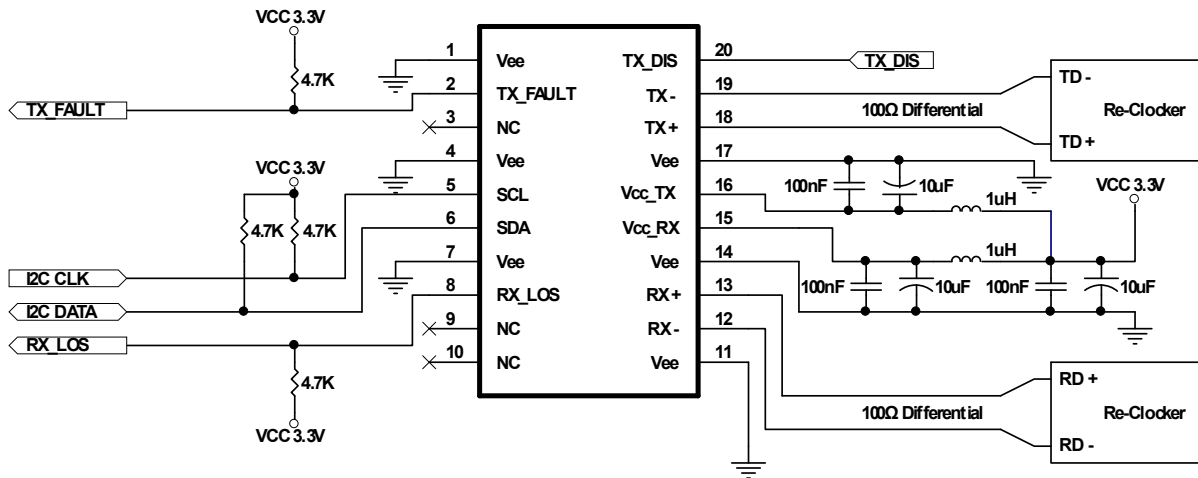
Module Definition 4 specifies a serial definition protocol. For this definition, upon power up, SCL and SDA appear as no connector (NC). When the host system detects this condition, it activates the serial protocol. The protocol uses the 2-wire serial CMOS E<sup>2</sup>PROM protocol of the ATMEL AT24C01A/02/04 family of components.

### CONNECTION DIAGRAM



PIN	Name	Function	Notes
1	Vee	Signal Ground	
2	TX_Fault	Transmitter Fault Indicator (Active high, open-drain)	
3	NC	No Connection	
4	Vee	Signal Ground	
5	SCL	Serial I <sup>2</sup> C Clock	
6	SDA	Serial I <sup>2</sup> C Data	
7	Vee	Signal Ground	
8	RX_LOS	Receiver Loss of Signal Indicator (Active high, open-drain)	
9	NC	No Connection	
10	NC	No Connection	
11	Vee	Signal Ground	
12	RX-	Negative Differential Output	
13	RX+	Positive Differential Output	
14	Vee	Signal Ground	
15	Vcc RX	Power Supply	+3.3V±5%
16	Vcc TX	Power Supply	+3.3V±5%
17	Vee	Signal Ground	
18	TX+	Positive Transmitter Data In	AC coupled differential lines with 100 ohm differential termination inside the module
19	TX-	Negative Transmitter Data In	
20	TX_DIS	Transmitter Disable	Internal 4.7 kΩ pull-up. The bias current and modulation current are turned off if TX1_DIS = HIGH.

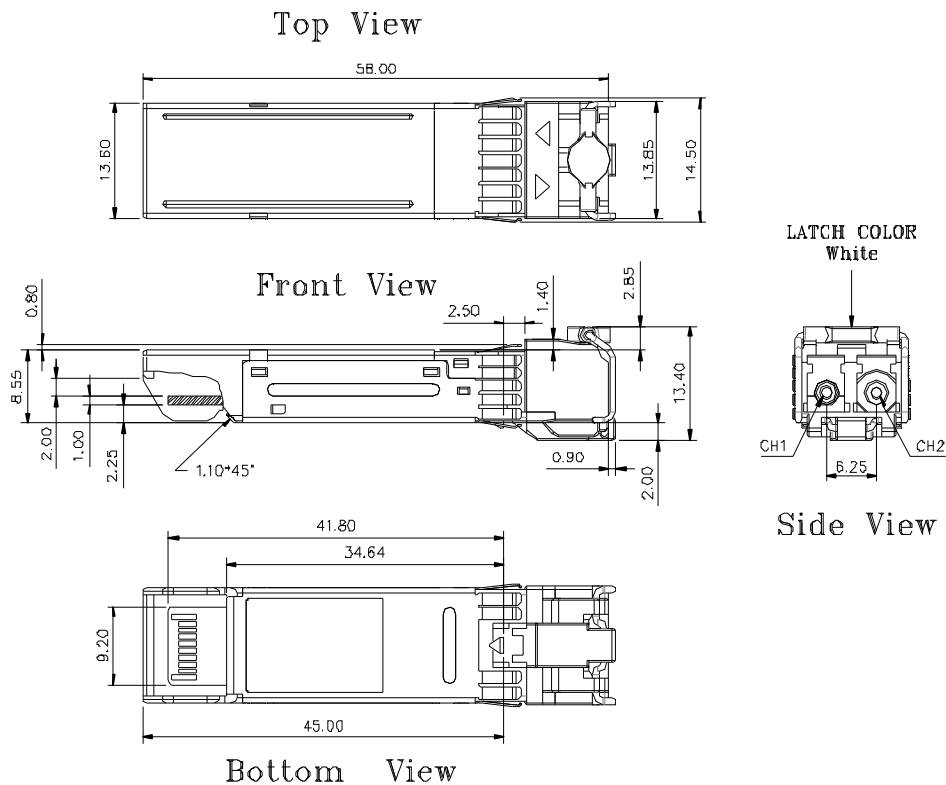
### RECOMMENDED CIRCUIT SCHEMATIC



1. Consult the Chipset manufacturer's applications information for biasing required for TX outputs. Some chipset outputs are internally biased and may not need external bias resistor.

### PACKAGE DIAGRAM

Units in mm



**Note:** Specifications subject to change without notice.

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**REVISION HISTORY**

Version	Subject	Release Date
1.0	Initial datasheet	2017/4/5