

Professional high-speed optical transceiver

OPN-S9P131-10LC2 / OPN-S9P131-10LC2I

25GE / 10 km / CWDM Digital Diagnostic SFP28 LC SINGLE-MODE TRANSCEIVER

PRODUCT FEATURES

- Up to 25.78 Gbps Bi-directional Data Links
 - Complaint with SFF-8402 SFP28 MSA
 - Support 25GBASE
 - Support CPRI Option 10 @ 24.33Gbps
 - Built-in dual CDR
 - 14.3 Power Budget at Least
- Uncooled 6-Wavelength CWDM DFB LD: from 1310nm to 1370 nm
 - SFF-8472 Digital Diagnostic Function
 - AC/AC Coupling according to MSA
 - Single +3.3 V Power Supply
 - RoHS Compliant
 - 0 to 70°C Operation: OPN-S9P131-10LC2
 - -50 to 85°C Operation: OPN-S9P131-10LC2I
- Class 1 Laser International Safety Standard IEC-60825Compliant
 - Enhanced EWRAP and OWRAP operational features
 - CDR auto sensing

APPLICATIONS

- 25G Ethernet
- CPRI Option 10

PRODUCT DESCRIPTION

The OPN-S9P131-10LC2 series single mode transceiver is a small form factor pluggable module for bi-directional serial optical data communications such as 25G Ethernet and CPRI Option 10. It is with the SFP+ 20-pin connector to allow hot plug capability. Digital diagnostic functions are available via an I²C. This module is designed for single mode fiber and operates at a nominal wavelength of CWDM wavelength. The transmitter section uses a CWDM multiple quantum well DFB laser and is a class 1 laser compliant according to International Safety Standard IEC-60825. The receiver section uses an integrated InGaAs detector preamplifier (IDP) mounted in an optical header and a rate selection clock data recovery (CDR) IC.

ORDER INFORMATION

P/No.	Bit Rate (Gb/s)	25GBASE	CPRI	Power Budget (dB)	Wavelength (nm)	Package	Case Temp (°C)	RoHS Compliant
OPN-S9P131-10LC2	Up to 25.78	LR	Option 10	> 14.3	CWDM*	SFP28 with DMI	0 to 70	Yes
OPN-S9P131-10LC2I	Up to 25.78	LR	Option 10	> 14.3	CWDM*	SFP28 with DMI	-50 to 85	Yes

CWDM* Wavelength

Central Wavelength	Min.(nm)	Typ.(nm)	Max.(nm)	Central Wavelength	Min.(nm)	Typ.(nm)	Max.(nm)
127	1264.5	1270	1277.5	133	1324.5	1330	1337.5
129	1284.5	1290	1297.5	135	1344.5	1350	1357.5
131	1304.5	1310	1317.5	137	1364.5	1370	1377.5

CWDM*: 6 wavelengths from 1310 nm to 1370 nm, each step 20 nm.

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature	Tstg	-50	85	°C	
Relative Humidity	RH	5	85	%	Non-condensing
Operating Case Temperature	Topr	0	70	°C	OPN-S9P131-10LC2
		-50	85		OPN-S9P131-10LC2I
Power Supply Voltage	Vcc	-0.5	3.6	V	

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Recommended Operating Conditions					
Parameter	Symbol	Min	Typ	Max	Units / Notes
Power Supply Voltage	V _{CC}	3.135	3.3	3.465	V
Operating Case Temperature	T _{opr}	0 -50		70 85	°C / OPN-S9P131-10LC2 °C / OPN-S9P131-10LC2I
Relative Humidity	RH	5		85	% / Non-condensing
Power Supply Current	I _{CC(TX+RX)}		270	340	mA / OPN-S9P131-10LC2
			270	500	mA / OPN-S9P131-10LC2I
Data Rate			25.78		Gb/s

Transmitter Optical Specifications (0°C < T _{opr} < 70°C, 3.13V < V _{CC} < 3.47V)						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Average Launch Power	P _{o, AVG}	1		5	dBm	1
Output Center Wavelength	λ	$\lambda_c - 5.5$	λ_c	$\lambda_c + 7.5$	nm	2
Output Spectrum Width	$\Delta\lambda$	---		1	nm	-20 dB width
Side Mode Suppression Ratio	SMSR	30			dB	
Extinction Ratio	ER	3.0			dB	
Relative Intensity Noise	RIN			-130	dB/Hz	
Optical Return Loss Tolerance	ORL			20	dB	
Transmitter Reflectance	R _T			-26	dB	
Average Launch Power of OFF Transmitter				-30	dBm	

- Output power is power coupled into a 9/125 μ m single-mode fiber.
- ITU-T G.694.2 CWDM wavelength from 1310 nm to 1370 nm, each step 20 nm.

Receiver Optical Specifications (0°C < T _{opr} < 70°C, 3.13V < V _{CC} < 3.47V)						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Sensitivity, Average	Sens			-13.3	dBm	3
Receiver Overload	P _{MAX}	2			dBm	3
LOS – Deasserted	LOS _D	---	---	-14	dBm	Transition: low to high
LOS – Asserted	LOS _A	-24	---	---	dBm	Transition: high to low
Wavelength of Operation	λ_c	1260		1380	nm	
Receiver Reflectance	R _R			-26	dB	

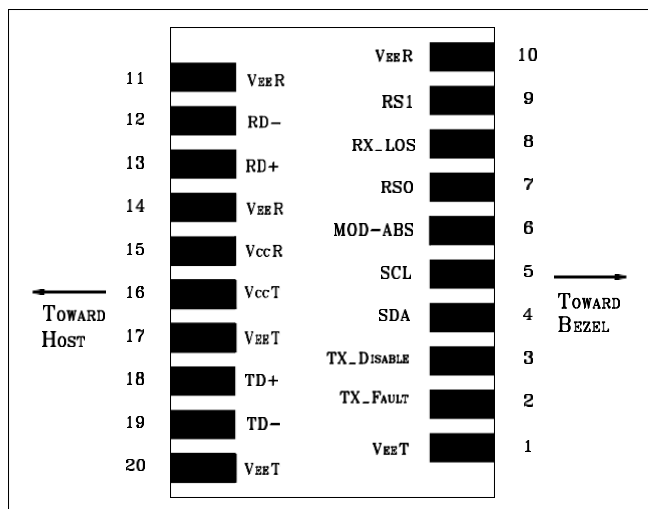
- Measured @ BER < 5E-5 and PRBS 2³¹-1.

Electrical Characteristics						
Parameter	Symbol	Min	Typ	Max	Units	Notes
High-Speed Signal (CML) Interface Specification						
Input Data Rate			25.78		Gb/s	
TX Clock Tolerance		-100		+100	ppm	4
Differential Input Impedance	R _{in}		100		Ω	
Differential Data Input Amplitude		150		1000	mV _{pp}	Internally AC coupled
Output Data Rate		8.5	25.78		Gb/s	
RX Clock Tolerance		-100		+100	ppm	4
Differential Output Impedance	R _{out}		100		Ω	
Differential Data Output Amplitude		350	600	700	mV _{pp}	Internally AC coupled
Low-Speed Signal (LVTTTL) Interface Specification						
Input High Voltage		2.0		V _{CC} +0.3	V	
Input Low Voltage		GND		0.8	V	
Output High Voltage		2.4		V _{CC}	V	
Output Low Voltage		GND		0.5	V	

- Clock tolerance for 25.78Gb/s.

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CONNECTION DIAGRAM



PIN	Signal Name	Description	PIN	Signal Name	Description
1	VEE T	Transmitter Signal Ground	11	VEE R	Receiver Signal Ground
2	TX_Fault	Transmitter Fault Indication. Logic “1” Output = Laser Fault. Logic “0” Output = Normal Operation	12	RD-	Inverse Receiver Data Out
3	TX_Disable	Logic “1” Input (or no connection) = Laser off, Logic “0” = Laser on.	13	RD+	Receiver Data Out
4	SDA	Modulation Definition 2 – Two wires serial ID Interface	14	VEE R	Receiver Signal Ground
5	SCL	Modulation Definition 1 – Two wires serial ID Interface	15	VCC R	Receiver Power – 3.3V±5%
6	MOD-ABS	Modulation Definition 0 – Ground in Module	16	VCC T	Transmitter Power – 3.3V±5%
7	RS0	RX Rate Select: This pin has an internal 30k pulldown to ground. A signal on this pin will not affect module performance.	17	VEE T	Transmitter Signal Ground
8	RX_LOS	Loss of Signal Out (OC).	18	TD+	Transmitter Data In
9	RS1	TX Rate Select: This pin has an internal 30k pulldown to ground. A signal on this pin will not affect module performance.	19	TD-	Inverse Transmitter Data In
10	VEE R	Receiver Signal Ground	20	VEE T	Transmitter Signal Ground

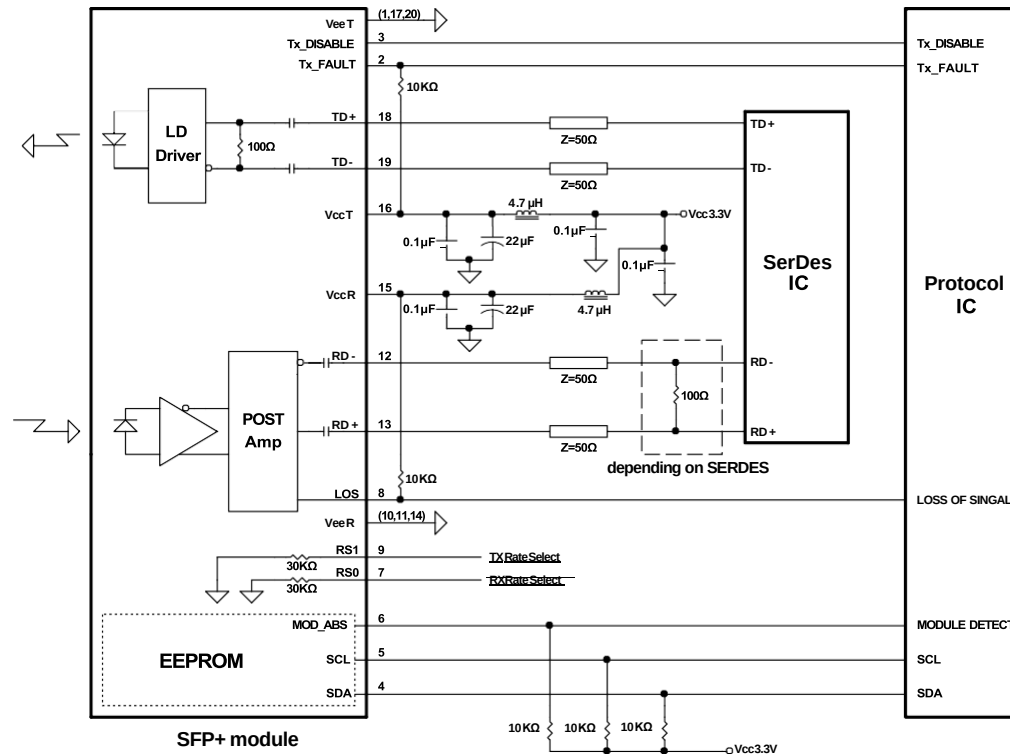
MODULE DEFINITION

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

Module Definition 4 specifies a serial definition protocol. For this definition, upon power up, SDA and SCL appear as no connector (NC) and MOD-ABS is TTL LOW. When the host system detects this condition, it activates the serial protocol. The protocol uses the 2-wire serial CMOS E²PROM protocol of the ATMEL AT24C01A/02/04 family of components.

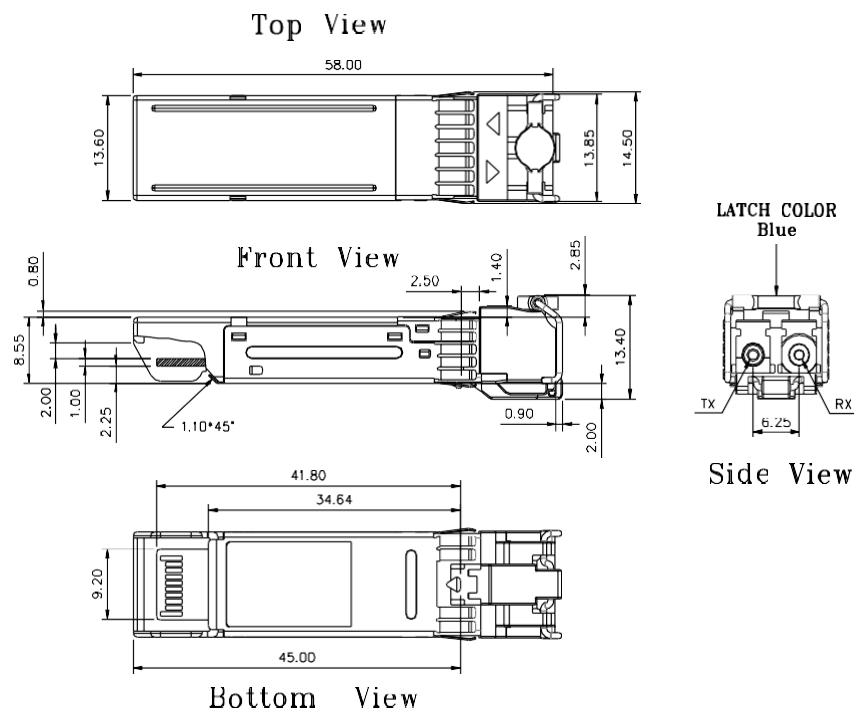
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RECOMMENDED CIRCUIT SCHEMATIC



PACKAGE DIAGRAM

Units in mm



Note: Specifications subject to change without notice.