

Professional high-speed optical transceiver

OPN-S9P1213-40LC / OPN-S9P1213-40LCI

1270 nm TX / 1330nm RX, 25GE Digital Diagnostic 1-Fiber SM LC SFP28 TRANSCEIVER

PRODUCT FEATURES

- 1-Fiber Bi-Directional SFP Optical Transceiver
- Up to 25.78 Gbps Bi-directional Data Links
 - Complaint with SFF-8402 SFP28 MSA
 - Support 25G Ethernet
- Support CPRI Option 10 @ 24.33Gbps
 - Built-in dual CDR
 - Distance up to 40 km
 - Simplex LC Connector
 - 1270nm DFB Transmitter
 - 1330nm Receiver
- 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-S9P1213-40LC
- -50 to 85°C Operation: OPN-S9P1213-40LCI
- 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-S9P1213-40LC 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. The transmitter section uses a 1270 nm 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)	CPRI	Distance (km)	Wavelength (nm)	Package	Case Temp (°C)	RoHS Compliant
OPN-S9P1213-40LC	Up to 25.78	Option 10	40	1270 DFB	SFP28 with DMI	0 to 70	Yes
OPN-S9P1213-40LCI	Up to 25.78	Option 10	40	1270 DFB	SFP28 with DMI	-50 to 85	Yes

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-S9P1213-40LC
		-50	85		OPN-S9P1213-40LCI
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-S9P1213-40LC °C / OPN-S9P1213-40LCI
Relative Humidity	RH	5		85	% / Non-condensing
Power Supply Current	I _{CC(TX+RX)}		270	340	mA
Data Rate			24.33 / 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}	4		8	dBm	1
Output Center Wavelength	λ _C	1260	1270	1280	nm	
Output Spectrum Width	Δλ	---		1	nm	-20 dB width
Side Mode Suppression Ratio	SMSR	30			dB	
Extinction Ratio	ER	4.0			dB	
Relative Intensity Noise	RIN			-130	dB/Hz	
Average Launch Power of OFF Transmitter				-30	dBm	

1. Output power is power coupled into a 9/125 μm single-mode fiber.

Receiver Optical Specifications (0°C < T _{opr} < 70°C, 3.13V < V _{CC} < 3.47V)						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Sensitivity	Sen			-16	dBm	2, Average Power
Receiver Overload	P _{MAX}	-7	---		dBm	
LOS – Deasserted	LOS _D	---	---	-20	dBm	Transition: low to high
LOS – Asserted	LOS _A	-35	---	---	dBm	Transition: high to low
Wavelength of Operation	λ _C	1320		1340	nm	3

2. Measured with worst ER; BER < 5E-5 and PRBS 2³¹-1.

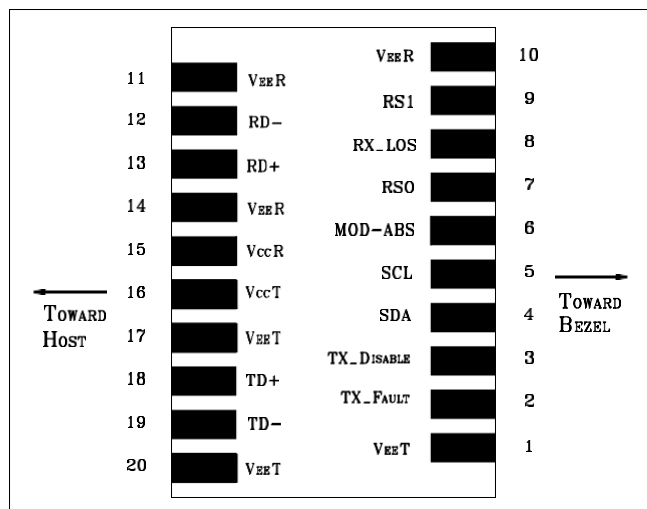
3. At least 30 dB optical isolation for the wavelength 1260 to 1280 nm.

Electrical Characteristics						
Parameter	Symbol	Min	Typ	Max	Units	Notes
High-Speed Signal (CML) Interface Specification						
Input Data Rate			24.33/25.78		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 (LVTTL) 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	

4. Clock tolerance for 24.33Gb/s and 25.78Gb/s.

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CONNECTION DIAGRAM



PIN	Signal Name	Description	PIN	Signal Name	Description
1	VEET	Transmitter Signal Ground	11	VEER	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	VEER	Receiver Signal Ground
5	SCL	Modulation Definition 1 – Two wires serial ID Interface	15	VCCR	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	VEET	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	VEER	Receiver Signal Ground	20	VEET	Transmitter Signal Ground

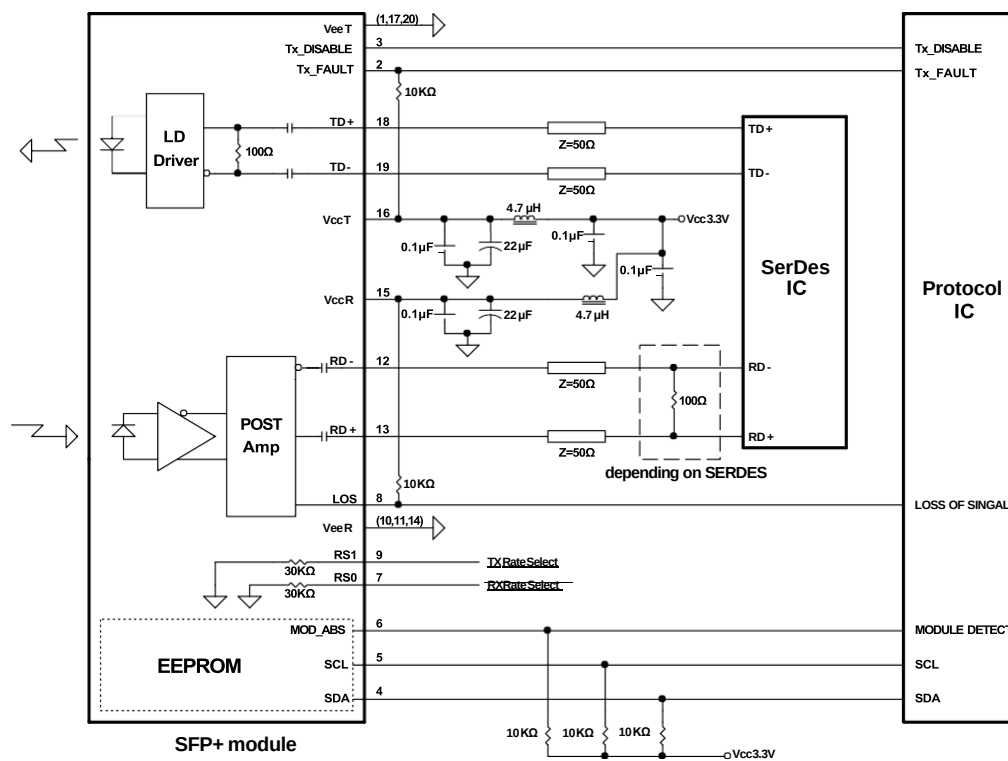
MODULE DEFINITION

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.

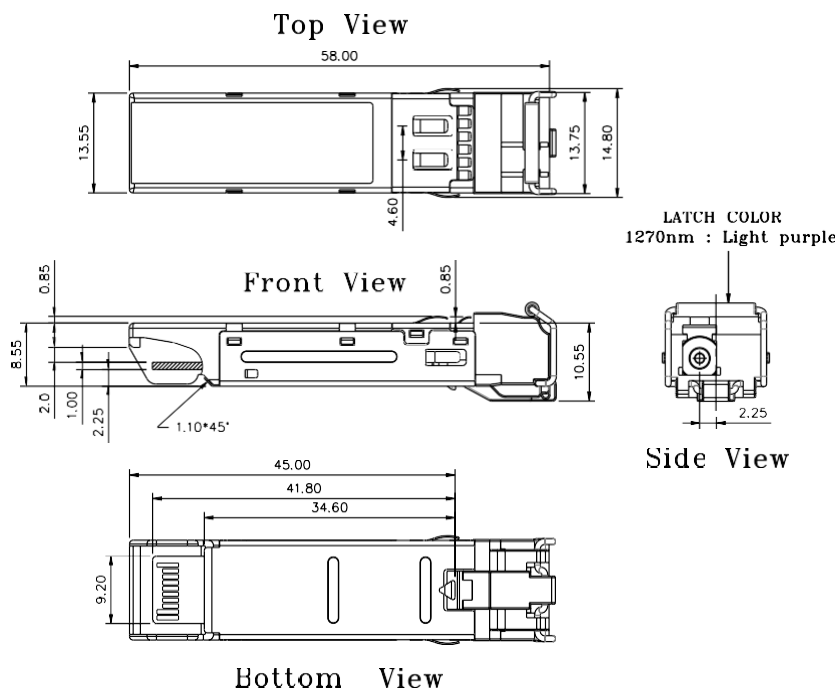
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RECOMMENDED CIRCUIT SCHEMATIC



PACKAGE DIAGRAM

Units in mm



Note: Specifications subject to change without notice.