

Professional high-speed optical transceiver

OPN-S1H1213-60LC / OPN-S1H1213-60LCI

10.3 Gbps / 60 km / 1270 nm TX / 1330 nm RX Digital Diagnostic 1-Fiber SM LC SFP+ Transceiver

PRODUCT FEATURES

- 1-Fiber Bi-Directional SFP Optical Transceiver
 - Up to 10.3 Gbps Bi-directional Data Links
 - Compliant with SFP+ MSA
 - Compliant to IEEE 802.3ae 10GBASE-BX
 - SFF-8472 Digital Diagnostic Function
 - Simplex LC Connector
 - 1270 nm DFB LD Transmitter
 - 1330 nm Receiver
 - Distance Up to 60 km
 - AC/AC Coupling according to MSA
 - Single +3.3 V Power Supply
 - RoHS Compliant
 - 0 to 70°C Operating: OPN-S1H1213-60LC
 - -50 to 85°C Operating: OPN-S1H1213-60LCI
 - Class 1 Laser International Safety Standard IEC 60825 Compliant

APPLICATIONS

- 10G Ethernet Links

PRODUCT DESCRIPTION

The OPN-S1H1213-60LC series single mode transceiver is a small form factor pluggable module for bi-directional serial optical data communications such as IEEE 802.3ae 10GBASE-BX by using 1270 nm transmitter and 1330 nm receiver. It is with the SFP 20-pin connector to allow hot plug capability. Digital diagnostic functions are available viaan I²C series bus specified in the SFP MSA SFF-8472. The transmitter section uses a multiple quantum well 1270 nm DFB laser and is a class 1 laser compliant according to International Safety Standard IEC 60825. The receiver section uses an integrated 1330 nm detector preamplifier (IDP) mounted in an optical header and a limitingpost-amplifier IC.

ORDER INFORMATION

P/No.	Bit Rate (Gb/s)	10GBASE	Distance (km)	TX (nm)	RX (nm)	Package	Temp(°C)	RoHS Compliant
OPN-S1H1213-60LC	10.3	BX	60	1270 DFB	1330	LC SFP+ with DMI	0 to 70	Yes
OPN-S1H1213-60LCI	10.3	BX	60	1270 DFB	1330	LC SFP+ with DMI	-50 to 85	Yes

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature	Tstg	-50	85	°C	
Operating Case Temperature	Topr	0 -50	70 85	°C	OPN-S1H1213-60LC OPN-S1H1213-60LCI
Relative Humidity	RH	0	85	%	Non condensing
Power Supply Voltage	Vcc	0	3.6	V	
Input Voltage	---	GND	Vcc	V	
Output Current	Iout	0	30	mA	

Professional high-speed optical transceiver

Recommended Operating Conditions					
Parameter	Symbol	Min	Typ	Max	Units / Notes
Power Supply Voltage	V _{CC}	3.13	3.3	3.47	V
Power Supply Current	I _{CC} (TX+RX)		280	350	mA / OPN-S1H1213-60LC
			280	450	mA / OPN-S1H1213-60LCI
Operating Case Temperature	T _{opr}	0		70	°C / OPN-S1H1213-60LC
		-50		85	°C / OPN-S1H1213-60LCI
Data Rate			10.3125		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}	3		7	dBm	1
OMA Modulation Amplitude	P _{O, OMA}	2			dBm	
Output Center Wavelength	λ _c	1260	1270	1280	Nm	
Output Spectrum Width	σ _λ			1	Nm	-20 dB width
Side Mode Suppression Ratio	SMSR	30			dB	
Extinction Ratio	ER	3.5			dB	
Relative Intensity Noise	RIN			-128	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 at 10.3 Gb/s				-20	dBm	2, Average Power
Receiver Overload	P _{MAX}	-5	---		dBm	2, Average Power
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

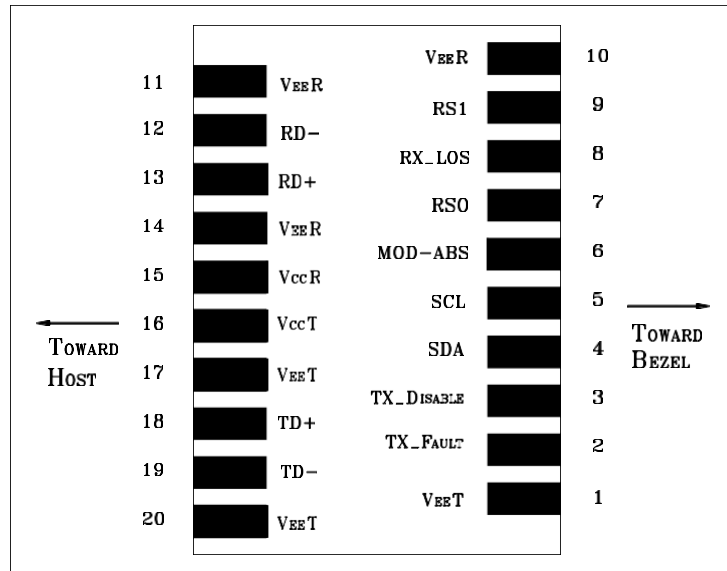
2. Measured with average power; BER < 10⁻¹² and PRBS 2³¹-1.

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			10.3125		Gb/s	
Differential Input Impedance	R _{in}		100		Ω	
Differential Data Input Amplitude		150		1000	mV _{pp}	Internally AC coupled
Output Data Rate			10.3125		Gb/s	
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	

Professional high-speed optical transceiver

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 (LVTTL). 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 (LVTTL). 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

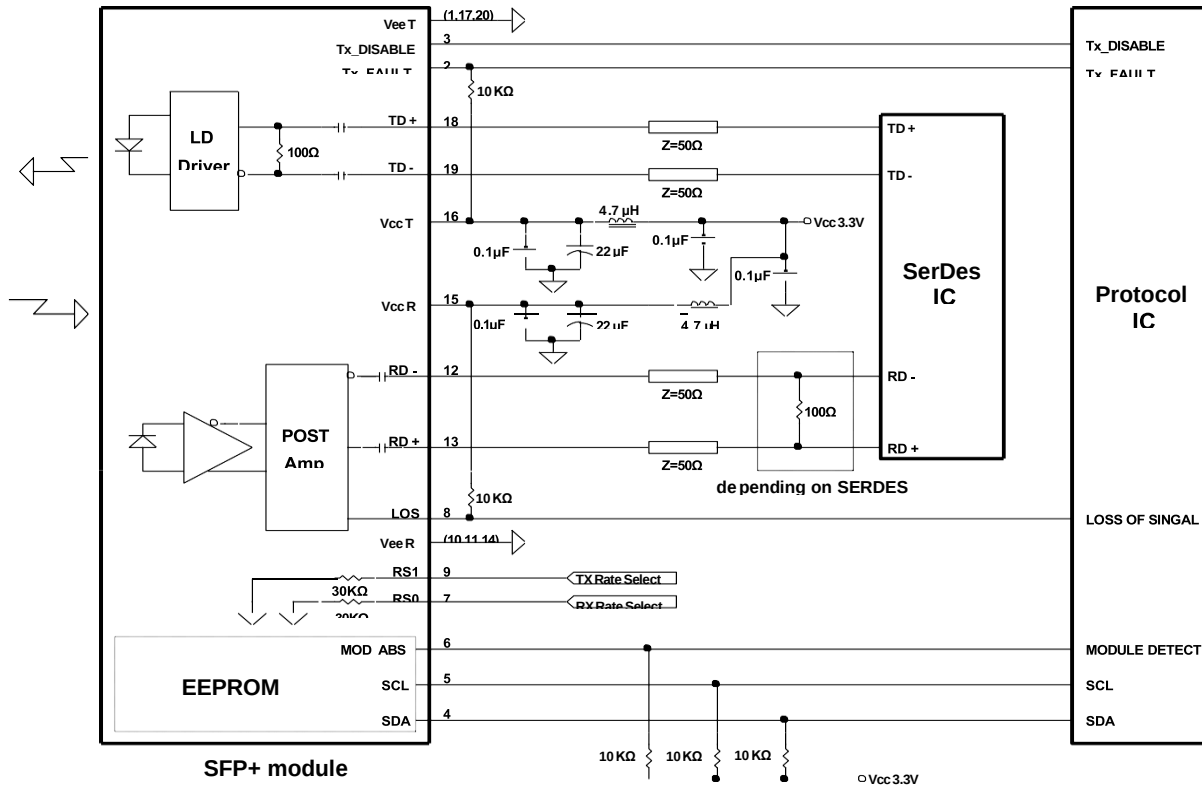
MODULE DEFINITION

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 connection (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.

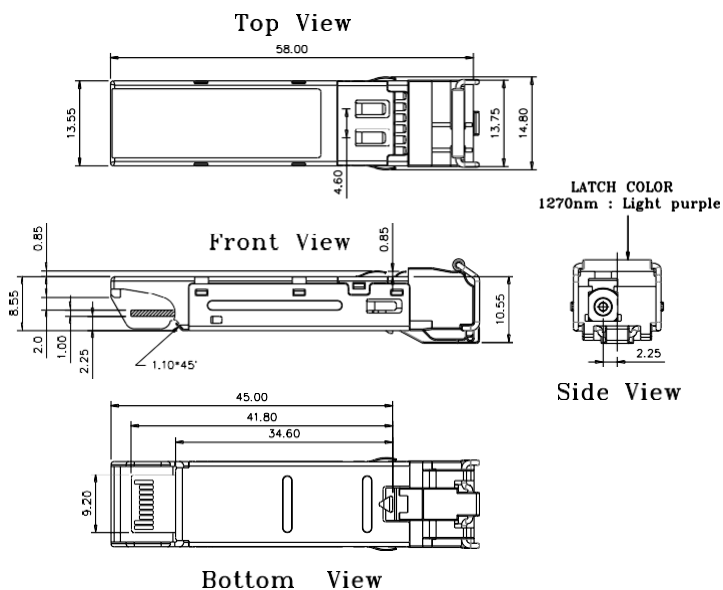
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RECOMMENDED CIRCUIT SCHEMATIC



PACKAGE DIAGRAM

Units in mm



Note: Specifications subject to change without notice.