Professional high-speed optical transceiver

OPN-SG13-2LC2I-MO

3.3V / 1310 nm / 1.25 Gbps Digital Diagnostic LC SFP SINGLE-MODE TRANSCEIVER

PRODUCT FEATURES

- Hot-Pluggable SFP Footprint LC Optical Transceiver
- Small Form-Factor Pluggable (SFP) MSA compatible
- Compliant with IEEE 802.3z 1000BASE-LX
- Compliant with Fibre Channel 1x SM-LC-L FC-PI
- SFF-8472 Digital Diagnostic Function
- AC/AC Coupling according to MSA
- Distance up to 2 km
- Single +3.3 V Power Supply
- RoHS Compliant
- 0 to 70ºC Operation
- Class 1 Laser International Safety Standard IEC-60825Compliant

APPLICATIONS

- Gigabit Ethernet Switches and Routers
- Fibre Channel Switch Infrastructure
- XDSL Applications
- Metro Edge Switching

PRODUCT DESCRIPTION

The OPN-SG13-2LC2I-MO series single mode transceivers are smallform factor pluggable module for bi-directional serial optical data communications such as Gigabit Ethernet 1000BASE-LX and Fibre Channel 1x SM-LC-L FC-PI. It iswith the SFP 20-pin connector to allow hot plug capability.Digital diagnostic functions are available via an I^2C. This module is designed for single mode fiber and operates at a nominal wavelength of 1310 nm. The transmitter section uses a multiple quantum well laser and is a class 1 laser compliant according to International Safety Standard IEC-60825. The receiver section uses an integrated InGaAsdetector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC.

ORDER INFORMATION

P/No.	Bit Rate (Gb/s)	1000 BASE	Distance (km)	Wavelength(nm)	Package	Temp.(ºC)	TX Power (dBm)	RX Sens. (dBm)	RoHS Compliant
OPN-SG13-2LC2I-MO	1.25	LX / LH	2	1310	LC SFP with DMI	0 to 70	-1 to -9	-1 to -19	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	LC2 / LC2I
Relative Humidity	RH	5	95	%	Non-condensing
Power Supply Voltage	Vcc	-0.5	3.6	V	
Receiver Input Optical Power	Pin(max)	-	+3	dBm	Average power

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Recommended Operating Conditions					
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units / Notes**
Power Supply Voltage	Vcc	3.1	3.3	3.5	V
Operating Case Temperature	Topr	0 / -50	25	70 / 85	°C (LC2 / LC2I)
Relative Humidity	RH	5	-	95	% Non-condensing
Power Supply Current	Icc(TX+RX)	-	200	300	mA
Power Consumption	Pd	-	0.8	1.0	W
Data Rate	-	100	1250	1300	Mb/s

Transmitter Specifications (0ºC < Topr < 70ºC, 3.1V < Vcc < 3.5V)						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes**
Optical						
Optical Transmit Power	Po	-9	-	-1	dBm	1
Output Center Wavelength	λc	1270	1310	1355	nm	
Output Spectrum Width (RMS)	σλ	-	-	1.8	nm	
Side Mode Suppression Ratio	SMSR	30	-	-	dB	
Extinction Ratio	ER	9	-	-	dB	
Output Eye	Compliant with IEEE 802.3z					
Optical Rise Time (20-80%)	tr	-	-	260	ps	
Optical Fall Time (20-80%)	tf	-	-	260	ps	
Relative Intensity Noise	RIN	-	-	-120	dB/Hz	
Total Jitter	TJ	-	-	0.227	ns	2
Electrical						
Data Input Current – Low	I_{IL}	-350			μA	
Data Input Current – High	I_{IH}			350	μA	
Differential Input Voltage	V_{IH} - V_{IL}	0.5		2.4	V	Peak-to-Peak
TX Disable Input Voltage – Low	$T_{DIS, L}$	0		0.5	V	2
TX Disable Input Voltage – High	$T_{DIS, H}$	2.0		Vcc	V	2
TX Disable Assert Time	T_{ASSERT}			10	μs	
TX Disable Deassert Time	$T_{DEASSERT}$			1	ms	
TX Fault Output Voltage -- Low	T_{FaultL}	0		0.5	V	3
TX Fault Output Voltage -- High	T_{FaultH}	2.0		Vcc+0.3	V	3

1. Output power is power coupled into a 9/125 μm single mode fiber.
2. There is an internal 4.7K to 10K ohm pull-up resistor to VccTX.
3. Open collector compatible, 4.7K to 10K ohm pull-up to Vcc (Host Supply Voltage).

Receiver Specifications (0ºC < Topr < 70ºC, 3.1V < Vcc < 3.5V)						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes**
Optical						
Sensitivity (Average Power)	Sens	-	-	-19	dBm	BER < 1E-12
Maximum Input Power	Pin(max)	-1	-	-	dBm	
Signal Detect – Asserted	Pa	-	-	-21	dBm	Transition: low → high
Signal Detect – Deasserted	Pd	-36	-	-	dBm	Transition: high → low
Signal Detect Hysteresis	-	1.0	-	-	dB	
Wavelength of Operation	λ	1260	-	1610	nm	
Link Budget	LB	-	10	-	dB	2 km, 1310 nm
Dispersion Penalty	DP	-	5	-	dB	2 km, 1310 nm
Optical Return Loss Tolerance	ORL	14	-	-	dB	
Electrical						
Differential Output Voltage	V_{OH} – V_{OL}	0.6		2.0	V	
Output LOS Voltage -- Low	V_{OL}	0		0.5	V	5
Output LOS Voltage – High	V_{OH}	2.0		Vcc+0.3	V	5

4. Measured at 2^7-1 PRBS at BER 1E-12 @ 1300 nm.
5. Open collector compatible, 4.7K to 10K ohm pull-up to Vcc (Host Supply Voltage).

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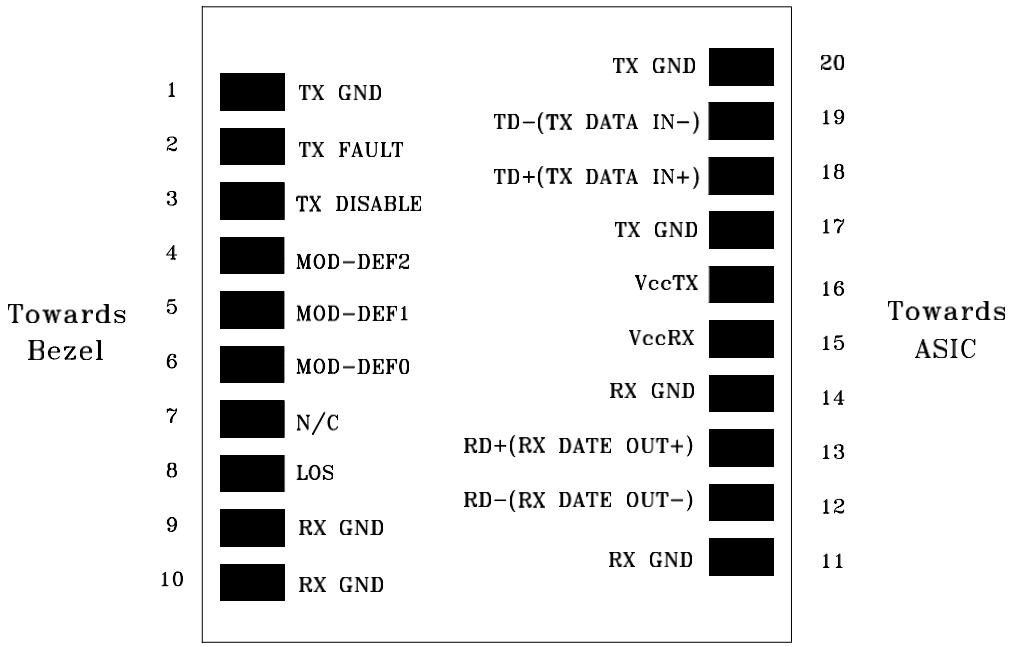
CONNECTION DIAGRAM



PIN	Signal Name	Description	PIN	Signal Name	Description
1	TX GND	Transmitter Ground	11	RX GND	Receiver Ground
2	TX Fault	Transmitter Fault Indication	12	RX DATA OUT-	Inverse Receiver Data Out
3	TX Disable	Transmitter Disable (Module disables on high or open)	13	RX DATA OUT+	Receiver Data Out
4	MOD-DFE2	Modulation Definition 2 – Two wires serial ID Interface	14	RX GND	Receiver Ground
5	MOD-DEF1	Modulation Definition 1 – Two wires serial ID Interface	15	Vcc RX	Receiver Power – 3.3V±5%
6	MOD-DEF0	Modulation Definition 0 – Ground in Module	16	Vcc TX	Transmitter Power – 3.3V±5%
7	N/C	Not Connected	17	TX GND	Transmitter Ground
8	LOS	Loss of Signal	18	TX DATA IN+	Transmitter Data In
9	RX GND	Receiver Ground	19	TX DATA IN-	Inverse Transmitter Data In
10	RX GND	Receiver Ground	20	TX GND	Transmitter Ground

Module Definition

Module Definition	MOD-DEF2 PIN 4	MOD-DEF1 PIN 5	MOD-DEF0 PIN 6	Interpretation by Host
4	SDA	SCL	LV-TTL Low	Serial module definition protocol

Module Definition 4 specifies a serial definition protocol. For this definition, upon power up, MOD-DEF(1:2) appear as no connector (NC) and MOD-DEF(0) is TTL LOW. When the host system detects this condition, it activates the serial protocol. The protocol uses the 2-wire serial CMOS E^2PROM protocol of the ATMEL AT24C01A/02/04 family of components.

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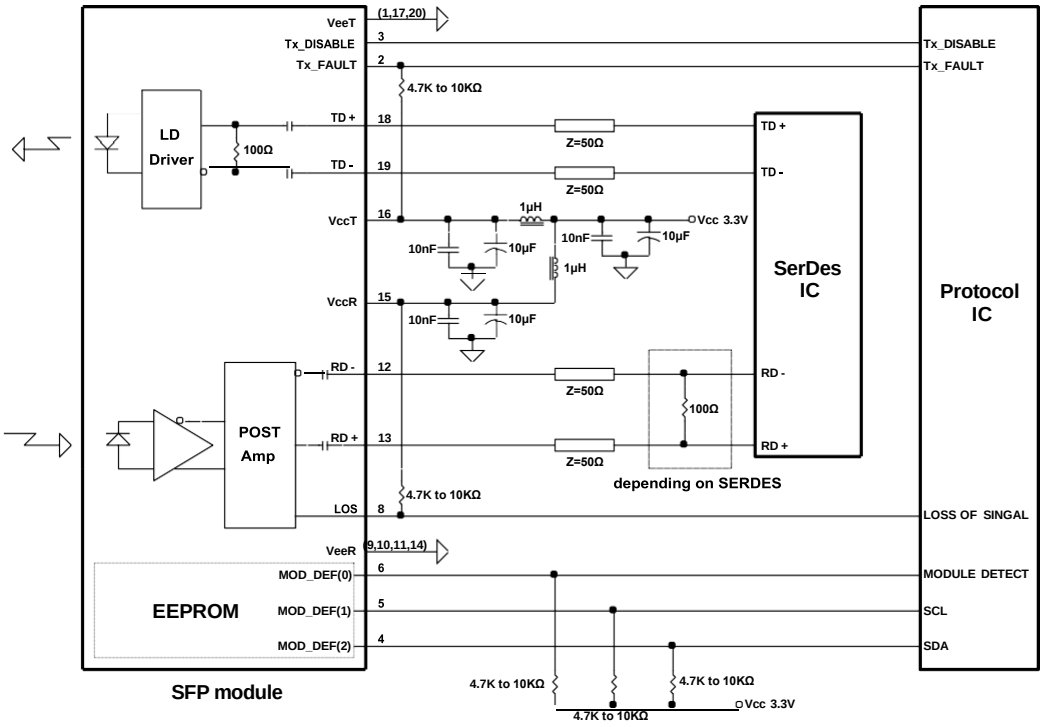
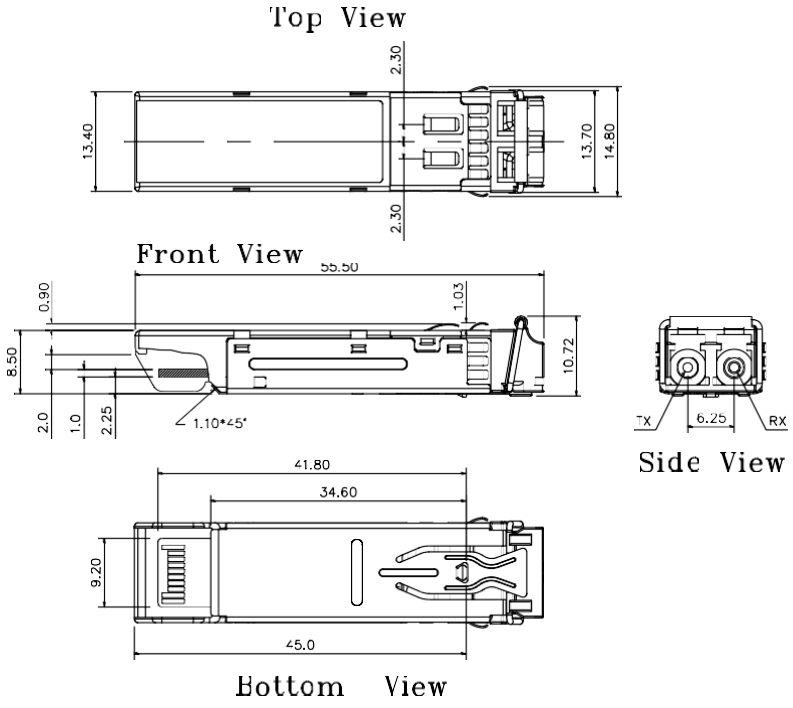
RECOMMENDED CIRCUIT SCHEMATIC



PACKAGE DIAGRAM

Units in mm



Note: Specifications subject to change without notice.