Professional high-speed optical transceiver

OPN-SF145-160LC2/ OPN-SF145-160LC2I

622 Mbps / 160 km / CWDM Digital Diagnostic SFP LC SINGLE-MODE TRANSCEIVER

PRODUCT FEATURES

- Hot-Pluggable SFP Footprint LC Optical Transceiver
- Small Form-Factor Pluggable (SFP) MSA compatible
- Compliant with Long-Reach SONET OC-12 / SDHSTM-4
- SFF-8472 Digital Diagnostic Function
- 18 Wavelength (λ): 1270 nm to 1610 nm CWDM DFBLD Transmitter
- 38 dB Power Budget at Least
- AC/AC Coupling according to MSA
- Single +3.3 V Power Supply
- RoHS Compliant
- 0 to 70ºC Operation: OPN-SF145-160LC2
- -50 to 85ºC Operation: OPN-SF145-160LC2I
- Class 1 Laser International Safety Standard IEC-60825Compliant

APPLICATIONS

- ATM Switches and Routers
- SONET / SDH Switch Infrastructure
- XDSL Applications
- Metro Edge Switching

PRODUCT DESCRIPTION

The OPN-SF145-160LC2 series single mode transceiver is small form factor pluggable module for bi-directional serial optical data communications such as SONET OC-12 / SDH STM-4 and Fiber Channel. 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. There are eighteen center wavelengths available from 1270 nm to 1610 nm, with each step 20 nm. A guaranteed minimum optical link budget of 38 dB is offered The transmitter section uses a multiple quantum well CWDM 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 limiting post-amplifier IC.

ORDER INFORMATION

P/No.	Bit Rate (Mb/s)	SONET /SDH	Power Budget (dB)	Wavelength (nm)	Package	Case Temp. (ºC)	TX Power (dBm)	RX Sens. (dBm)
OPN-SF145-160LC2	622		> 38	CWDM*	LC SFP with DMI	0 to 70	5 to 1	-37
OPN-SF145-160LC2I	622		> 38	CWDM*	LC SFP with DMI	-50 to 85	5 to 1	-37

CWDM* Wavelength (0 to 70ºC)

Central Wavelength	Min. (nm)	Typ. (nm)	Max. (nm)	Clasp Color Code	Central Wavelength	Min. (nm)	Typ. (nm)	Max. (nm)	Clasp Color Code
127	1264.5	1270	1277.5	Light Purple	145	1444.5	1450	1457.5	Yellow Orange
129	1284.5	1290	1297.5	Sky Blue	147	1464.5	1470	1477.5	Gray
131	1304.5	1310	1317.5	Yellow Green	149	1484.5	1490	1497.5	Violet
133	1324.5	1330	1337.5	Yellow Ocher	151	1504.5	1510	1517.5	Blue
135	1344.5	1350	1357.5	Pink	153	1524.5	1530	1537.5	Green
137	1364.5	1370	1377.5	Beige	155	1544.5	1550	1557.5	Yellow
139	1384.5	1390	1397.5	White	157	1564.5	1570	1577.5	Orange
141	1404.5	1410	1417.5	Silver	159	1584.5	1590	1597.5	Red
143	1424.5	1430	1437.5	Black	161	1604.5	1610	1617.5	Brown

CWDM*: 18 Wavelengths from 1270 nm to 1610 nm, each step 20 nm.

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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-SF145-160LC2 OPN-SF145-160LC2I
Power Supply Voltage	Vcc	-0.5	3.6	V	

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 -50		70 85	°C / OPN-SF145-160LC2 °C / OPN-SF145-160LC2I
Power Supply Current	$I_{CC\,(TX+RX)}$		200	300	mA / OPN-SF145-160LC2
				600	mA / OPN-SF145-160LC2I
Data Rate			622		Mb/s

Transmitter Specifications (0°C < Topr < 70°C, 3.13V < Vcc < 3.47V)						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes**
Optical						
Optical Transmit Power	Po	1	---	5	dBm	1
Output Center Wavelength	λ	λc –5.5	λc	λc +7.5	nm	2
Output Spectrum Width	Δλ	---	---	1	nm	-20 dB Width
Side Mode Suppression Ratio	SMSR	30			dB	
Extinction Ratio	E_R	10	---	---	dB	
Output Eye	Compliant with Bellcore TR-NWT-000253 and ITU recommendation G.957					
Optical Rise Time	t_r			1.2	ns	10 % to 90% Values
Optical Fall Time	t_f			1.2	ns	10 % to 90% Values
Relative Intensity Noise	RIN			-120	dB/Hz	
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	3
TX Disable Input Voltage – High	$T_{DIS,\,H}$	2.0		Vcc	V	3
TX Disable Assert Time	T_{ASSERT}			10	μs	
TX Disable Deassert Time	$T_{DEASSERT}$			1	ms	
TX Fault Output Voltage -- Low	T_{FaultL}	0		0.8	V	4
TX Fault Output Voltage -- High	T_{FaultH}	2.0		Vcc+0.3	V	4

1. Output power is power coupled into a 9/125 μm single mode fiber.
2. ITU-T G.694.2 CWDM wavelength from 1270 nm to 1610 nm, each step 20 nm.
3. There is an internal 4.7K to 10K ohm pull-up resistor to VccTX.
4. Open collector compatible, 4.7K to 10K ohm pull-up to Vcc (Host Supply Voltage).

Receiver Specifications (0°C < Topr < 70°C, 3.13V < Vcc < 3.47V)						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Units**	**Notes**
Optical						
Sensitivity	Sens			-37	dBm	4
Maximum Input Power	Pin	-9			dBm	4
Signal Detect -- Asserted	Pa	---		-37	dBm	Transition: low to high
Signal Detect -- Deasserted	Pd	-47	---	---	dBm	Transition: high to low
Signal detect -- Hysteresis		1.0	---		dB	
Wavelength of Operation		1100	---	1620	nm	
Electrical						

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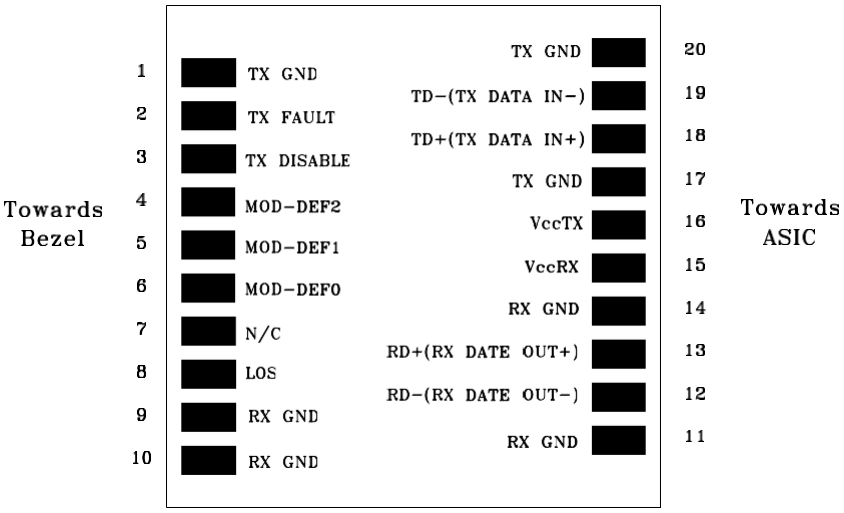
Differential Output Voltage	$V_{OH} - V_{OL}$	0.6		2.0	V	
Output LOS Voltage -- Low	V_{OL}	0		0.8	V	5
Output LOS Voltage -- High	V_{OH}	2.0		Vcc+0.3	V	5

4. Measured at 2^{23}-1 PRBS at BER 1E-10.

5. Open collector compatible, 4.7K to 10K ohm pull-up to Vcc (Host Supply Voltage).

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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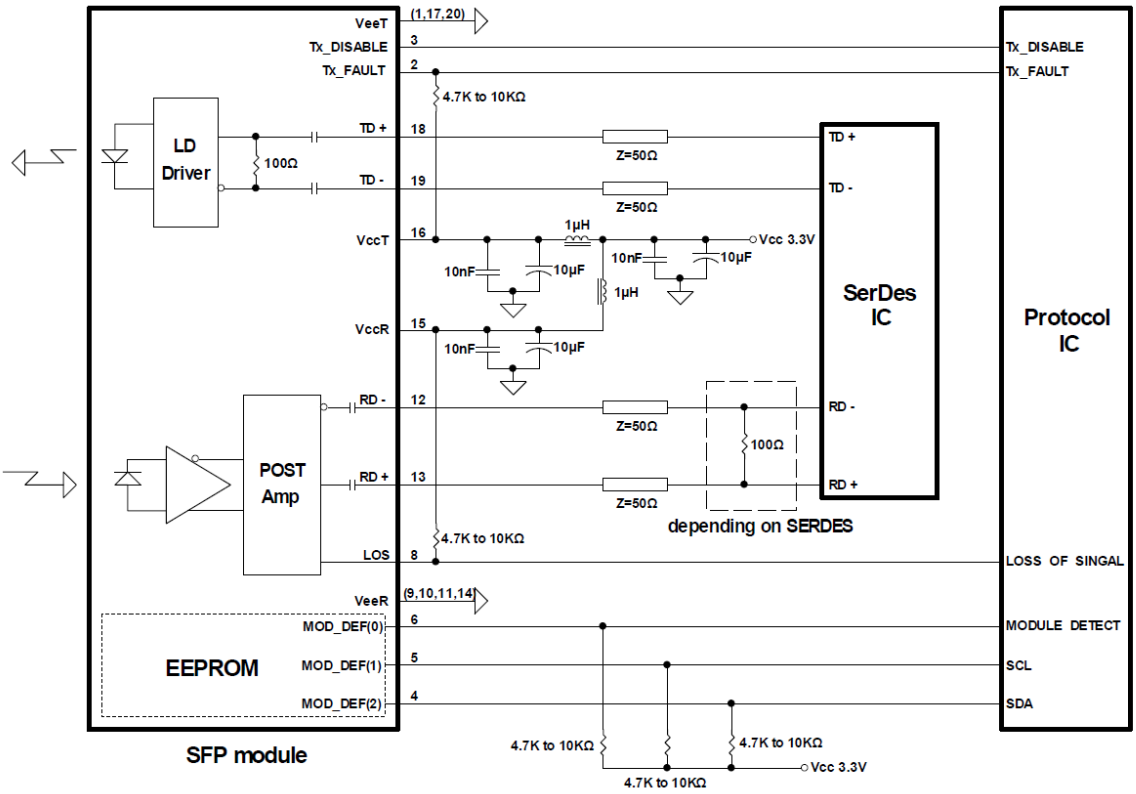
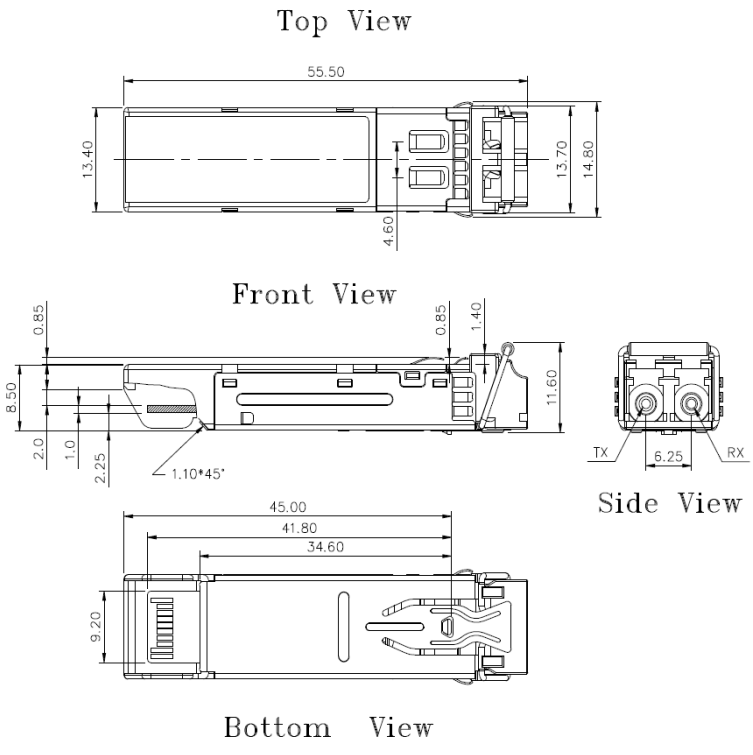
RECOMMENDED CIRCUIT SCHEMATIC



PACKAGE DIAGRAM

Units in mm

1)



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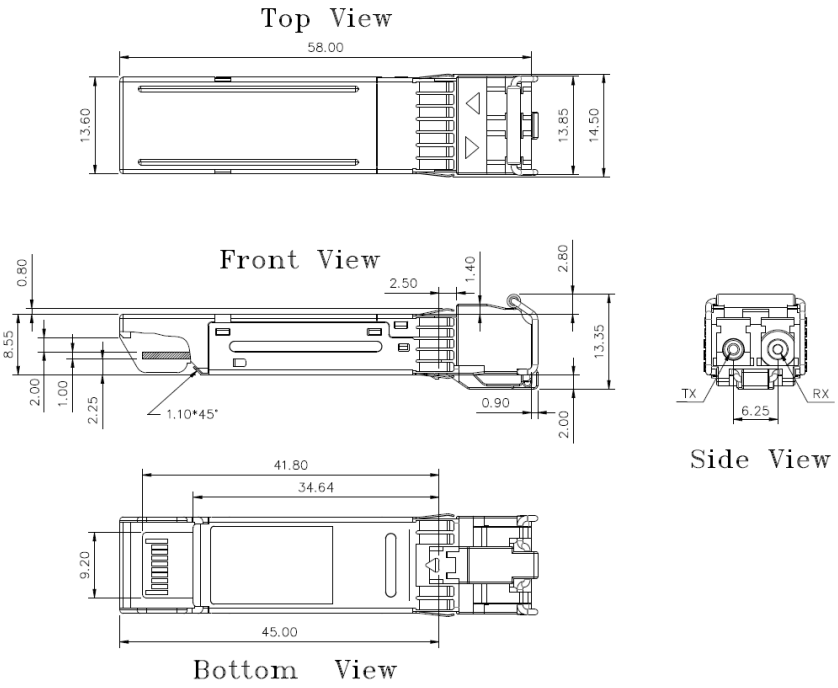
2)



OPN-SF145-160LC2I

Note: Specifications subject to change without notice.