



Professional high-speed optical transceiver

OPN-SF15-160LC2 / OPN-SF15-160LC2I
3.3V / 1550 nm / 622 Mbps LC SFP 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
 - 1550 nm DFB LD Transmitter
 - APD High Sensitivity Receiver
 - 38 dB Power Budget at Least
 - Distance up to 160 km
 - AC/AC Coupling according to MSA
 - Single +3.3 V Power Supply
 - RoHS Compliant
 - 0 to 70°C Operation: OPN-SF15-160LC2
 - -50 to 85°C Operation: OPN-SF15-160LC2I
- Class 1 Laser International Safety Standard IEC-60825 Compliant

APPLICATIONS

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

PRODUCT DESCRIPTION

The OPN-SF15-160LC2 series single mode transceivers is small form factor pluggable module for bi-directional serial optical data communications such as SONET OC-12 / SDHSTM-4 and Fiber Channel. It is with the SFP 20-pin connector to allow hot plug capability. This module is designed for single mode fiber and operates at a nominal wavelength of 1550 nm.

A guaranteed minimum optical link budget of 38 dB is offered which can correspond to a link distance of over 160 km (assuming worst case fiber loss of 0.2 dB/km). The transmitter section uses a multiple quantum well 1550 nm DFB laser and is a class 1 laser compliant according to International Safety Standard IEC-60825. The receiver section uses an integrated InGaAs Avalanche photodetector preamplifier mounted in an optical header and a limiting post-amplifier IC.

ORDER INFORMATION

P/No.	Bit Rate (Mb/s)	SONET /SDH	Distance (km)	Wavelength (nm)	Package	Temp. (°C)	TX Power (dBm)	RX Sens. (dBm)	RoHS Compliant
OPN-SF15-160LC2	622		160	1550 DFB	LC SFP	0 to 70	5 to 1	-37	Yes
OPN-SF15-160LC2I	622		160	1550 DFB	LC SFP	-50 to 85	5 to 1	-37	Yes

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature	Tstg	-50	85	°C	
Operating Case Temperature	Topr	0	70	°C	OPN-SF15-160LC2
		-50	85		OPN-SF15-160LC2I
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}	3.13	3.3	3.47	V
Operating Case Temperature	T _{opr}	0 -50		70 85	°C / OPN-SF15-160LC2 °C / OPN-SF15-160LC2I
Power Supply Current	I _{CC} (TX+RX)		230	300	mA
Data Rate			622		Mb/s

Transmitter Specifications (0°C < T _{opr} < 70°C, 3.13V < V _{CC} < 3.47V)						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Optical						
Optical Transmit Power	P _o	1	---	5	dBm	1
Output Center Wavelength	λ	1500	1550	1580	nm	
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	2
TX Disable Input Voltage – High	T _{DIS, H}	2.0		V _{CC}	V	2
TX Disable Assert Time	T _{ASSERT}			1	ms	
TX Disable Deassert Time	T _{DEASSERT}			50	μs	
TX Fault Output Voltage -- Low	T _{FaultL}	0		0.5	V	3
TX Fault Output Voltage -- High	T _{FaultH}	2.0		V _{CC} +0.3	V	3

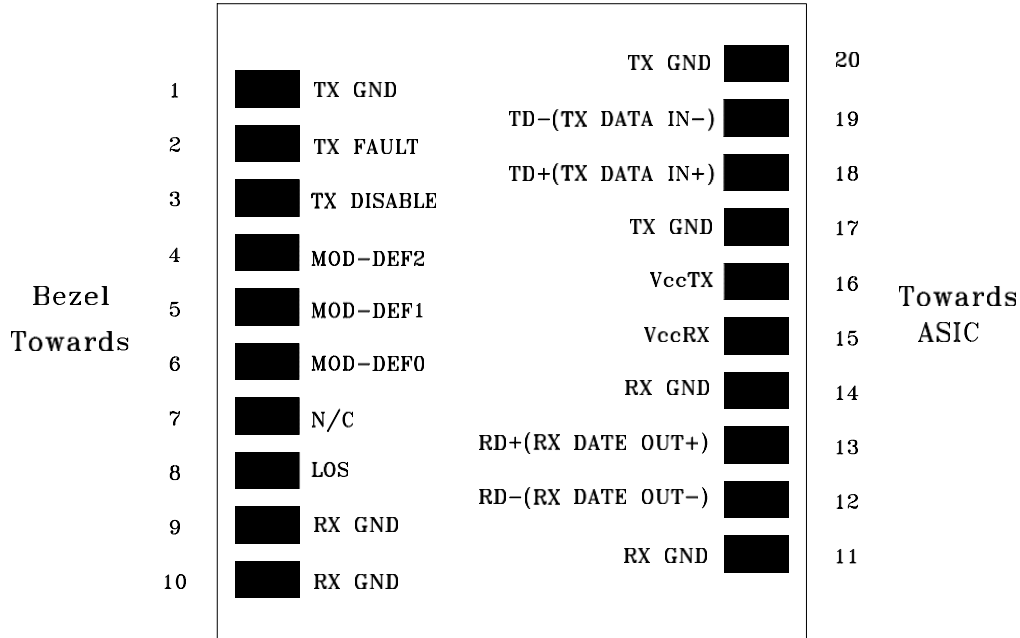
1. Output power is power coupled into a 9/125 μm single mode fiber.
2. There is an internal 4.7K to 10K ohm pull-up resistor to V_{CC}TX.
3. Open collector compatible, 4.7K to 10K ohm pull-up to V_{CC} (Host Supply Voltage).

Receiver Specifications (0°C < T _{opr} < 70°C, 3.13V < V _{CC} < 3.47V)						
Parameter	Symbol	Min	Typ	Max	Units	Notes
Optical						
Sensitivity	Sens			-37	dBm	4
Maximum Input Power	P _{in}	-9			dBm	4
Signal Detect -- Asserted	P _a	---		-37	dBm	Transition: low to high
Signal Detect -- Deasserted	P _d	-47	---	---	dBm	Transition: high to low
Signal detect -- Hysteresis		1.0	---		dB	
Wavelength of Operation		1100	---	1600	nm	
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		V _{CC} +0.3	V	5

4. Measured at 2²³-1 PRBS at BER 1E-10.
5. Open collector compatible, 4.7K to 10K ohm pull-up to V_{CC} (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

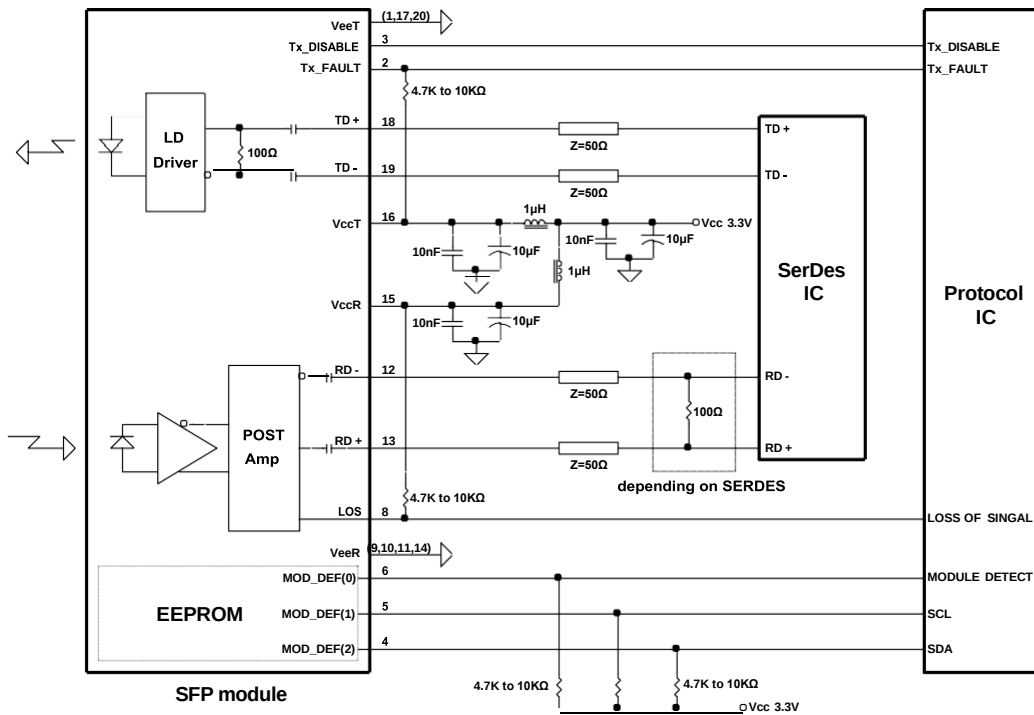
Module Definition	MOD-DEF2 PIN 4	MOD-DEF1 PIN 5	MOD-DEF0 PIN 6	Interpretation by Host
4	SDA	SCL	LV-TTL Low	Serial module definition protocol

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 E²PROM protocol of the ATMEL AT24C01A/02/04 family of components.



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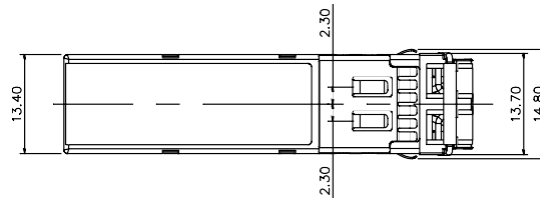
RECOMMENDED CIRCUIT SCHEMATIC



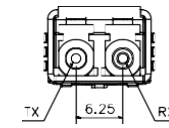
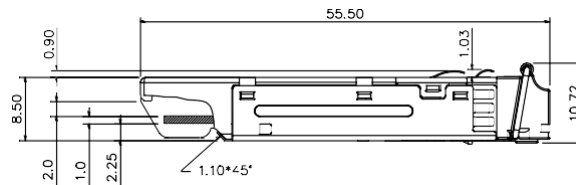
PACKAGE DIAGRAM

Units in mm

Top View

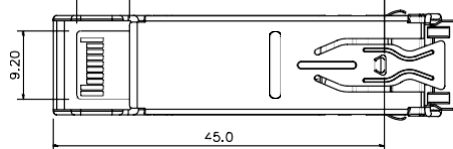


Front View



Side View

Bottom View



Note: Specifications subject to change without notice.