

Professional high-speed optical transceiver

OPN-SG129-D24LC2 / OPN-SG129-D24LC2I

3.3V / CWDM / 1.25 Gbps 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 IEEE 802.3z Gigabit Ethernet1000BASE-ZX
 - Compliant with Fibre Channel 1X SM-LC-L FC-PI
 - SFF-8472 Digital Diagnostic Function
- 18 Wavelength (λ): 1270 nm to 1610 nm CWDM DFBLD Transmitter
 - 24 dB Power Budget at Least
 - AC/AC Coupling according to MSA
 - Single +3.3 V Power Supply
 - RoHS Compliant
 - 0 to 70°C Operation: OPN-SG129-D24LC2
 - -50 to 85°C Operation: OPN-SG129-D24LC2I
- 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-SG129-D24LC2 series single mode transceivers are small form factor pluggable module for bi-directional serial optical data communications such as Gigabit Ethernet 1000BASE-ZX and Fibre Channel 1x SM-LC-L FC-PI. 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 an 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 24 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 (Gb/s) | 1000 BASE | Power Budget (dB) | Wavelength (nm) | Package | Temp. (°C) | TX Power (dBm) | RX Sens. (dBm) | RoHS Compliant |
|-------------------|-----------------|-----------|-------------------|-----------------|-----------------|------------|----------------|----------------|----------------|
| OPN-SG129-D24LC2 | 1.25 | ZX | > 24 | CWDM* | LC SFP with DMI | 0 to 70 | 5 to 0 | -24 | Yes |
| OPN-SG129-D24LC2I | 1.25 | ZX | > 24 | CWDM* | LC SFP with DMI | -50 to 85 | 5 to 0 | -24 | Yes |

CWDM* Wavelength (0 to 70°C)

| 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.

Professional high-speed optical transceiver

| 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-SG129-D24LC2 OPN-SG129-D24LC2I |
| Power Supply Voltage | Vcc | -0.5 | 3.6 | V | |

| 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 | | 70 85 | °C / OPN-SG129-D24LC2 °C / OPN-SG129-D24LC2I |
| Power Supply Current | I _{CC(TX+RX)} | | 200 | 300 600 | mA / OPN-SG129-D24LC2 mA / OPN-SG129-D24LC2I |
| Data Rate | | 100 | 1250 | | Mb/s |

| Transmitter Specifications (0°C < Topr < 70°C, 3.1V < Vcc < 3.5V) | | | | | | |
|---|-----------------------------------|----------------------|----------------|----------------------|-------|---------------------|
| Parameter | Symbol | Min | Typ | Max | Units | Notes |
| Optical | | | | | | |
| Optical Transmit Power | P _o | 0 | --- | 5 | dBm | 1 |
| Output Center Wavelength | λ | λ _c - 5.5 | λ _c | λ _c + 7.5 | nm | 2 |
| Output Spectrum Width | Δλ | --- | --- | 1 | nm | -20 dB Width |
| Side Mode Suppression Ratio | SMSR | 30 | | | dB | |
| Extinction Ratio | E _R | 9 | --- | --- | dB | |
| Optical Rise Time | t _r | | | 260 | ps | 20 % to 80 % Values |
| Optical Fall Time | t _f | | | 260 | ps | 20 % to 80 % 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 | | 0.5 | 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).

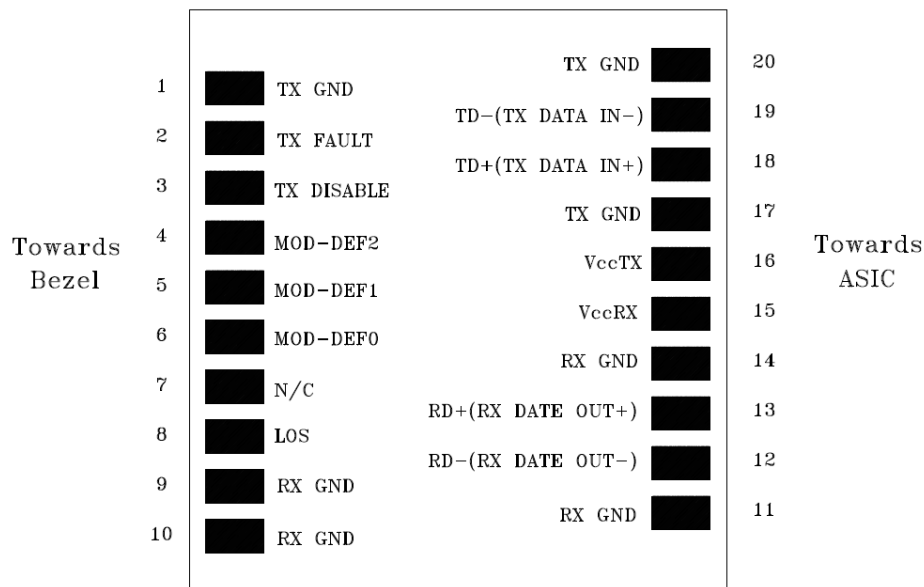
Professional high-speed optical transceiver

| Receiver Specifications (0°C < Topr <70°C, 3.1V < Vcc < 3.5V) | | | | | | |
|---|-----------------------------------|------|-----|---------|-------|-------------------------|
| Parameter | Symbol | Min | Typ | Max | Units | Notes |
| Optical | | | | | | |
| Sensitivity | Sens | | | -24 | dBm | 4 |
| Maximum Input Power | Pin | -3 | | | dBm | 4 |
| Signal Detect -- Asserted | Pa | --- | | -24 | dBm | Transition: low to high |
| Signal Detect -- Deasserted | Pd | -36 | --- | --- | dBm | Transition: high to low |
| Signal detect -- Hysteresis | | 1.0 | --- | | dB | |
| Wavelength of Operation | | 1100 | --- | 1620 | 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 | | Vcc+0.3 | V | 5 |

4. Measured at 2⁷-1 PRBS at BER 1E-12.

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 |

Professional high-speed optical transceiver

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.

RECOMMENDED CIRCUIT SCHEMATIC



Professional high-speed optical transceiver

PACKAGE DIAGRAM

Units in mm

1)



OPN-SG129-D24LC2

2)



OPN-SG129-D24LC2I

Note: Specifications subject to change without notice.