

## Professional high-speed optical transceiver

**OPN-S8G133-3D24SC / OPN-S8G133T-3D24SC**  
**OPN-S8G133-3D24SC-EMG / OPN-S8G133T-3D24SC-EMG**  
**OPN-S8G133-3D24ST / OPN-S8G133T-3D24ST**  
**OPN-S8G133-3D24FC / OPN-S8G133T-3D24FC**  
**CWDM 3.3V / 1.25 Gbps RoHS Compliant Optical Single-Mode Transceiver**

## PRODUCT FEATURES

- Duplex SC SM Transceiver: OPN-S8G133-3D24SC
- Duplex ST SM Transceiver: OPN-S8G133-3D24ST
- Duplex FC SM Transceiver: OPN-S8G133-3D24FC
  - Compliant with IEEE 802.3z Gigabit Ethernet
- 18-Wavelength CWDM DFB LD Transmitter from 1270 nm to 1610 nm, with step 20 nm
  - 24 dB Link Budget at Least
  - Industry Standard 1 x 9 Footprint
  - Single +3.3 V Power Supply
    - RoHS Compliant
- LVPECL Signal Detect Output: OPN-S8G133-3D24FC
- LVTTTL Signal Detect Output: OPN-S8G133T-3D24FC
  - Wave Solderable
- Class 1 Laser International Safety Standard IEC 60825 Compliant

## APPLICATIONS

- Gigabit Ethernet Links
- SONET / SDH Equipment Interconnect
  - Fibre Channel Links
  - CWDM

## PRODUCT DESCRIPTION

The OPN-S8G133-3D24FC series single mode transceiver is a low power, high performance CWDM module for bi-directional serial optical data communications such as Gigabit Ethernet and Fibre Channel. There are eighteen center wavelengths available from 1270 nm to 1610 nm, each step 20 nm. A guaranteed minimum optical link budget of 24 dB is offered. The transmitter section uses a multiple quantum well 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. A PECL logic interface simplifies interface to external circuitry.

## ORDER INFORMATION

| P/No.             | Bit Rate<br>(Mb/s) | 1000<br>BASE | Power<br>Budget<br>(dB) | Wavelength<br>(nm) | Voltage<br>(V) | Package      | Temp.<br>(°C) | TX<br>Power<br>(dBm) | RX<br>Sens.<br>(dBm) | RoHS<br>Compliant |
|-------------------|--------------------|--------------|-------------------------|--------------------|----------------|--------------|---------------|----------------------|----------------------|-------------------|
| OPN-S8G133-3D24FC | 1250               | ZX           | > 24                    | CWDM*              | 3.3            | 1X9 SC/ST/FC | 0 to 70       | 5 to 0               | -24                  | Y                 |

### CWDM Wavelength (0 to 70°C)

| Central<br>Wavelength | Min.<br>(nm) | Typ.<br>(nm) | Max.<br>(nm) | Central<br>Wavelength | Min.<br>(nm) | Typ.<br>(nm) | Max.<br>(nm) |
|-----------------------|--------------|--------------|--------------|-----------------------|--------------|--------------|--------------|
| 127                   | 1264.5       | 1270         | 1277.5       | 145                   | 1444.5       | 1450         | 1457.5       |
| 129                   | 1284.5       | 1290         | 1297.5       | 147                   | 1464.5       | 1470         | 1477.5       |

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|     |        |      |        |     |        |      |        |
|-----|--------|------|--------|-----|--------|------|--------|
| 131 | 1304.5 | 1310 | 1317.5 | 149 | 1484.5 | 1490 | 1497.5 |
| 133 | 1324.5 | 1330 | 1337.5 | 151 | 1504.5 | 1510 | 1517.5 |
| 135 | 1344.5 | 1350 | 1357.5 | 153 | 1524.5 | 1530 | 1537.5 |
| 137 | 1364.5 | 1370 | 1377.5 | 155 | 1544.5 | 1550 | 1557.5 |
| 139 | 1384.5 | 1390 | 1397.5 | 157 | 1564.5 | 1570 | 1577.5 |
| 141 | 1404.5 | 1410 | 1417.5 | 159 | 1584.5 | 1590 | 1597.5 |
| 143 | 1424.5 | 1430 | 1437.5 | 161 | 1604.5 | 1610 | 1617.5 |

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

#### Absolute Maximum Ratings

| Parameter             | Symbol | Min | Max | Units | Notes                    |
|-----------------------|--------|-----|-----|-------|--------------------------|
| Storage Temperature   | Tstg   | -50 | 85  | °C    |                          |
| Operating Temperature | Topr   | 0   | 70  | °C    | With air flow 1m/sec     |
| Soldering Temperature | ---    |     | 260 | °C    | 10 seconds on leads only |
| Power Supply Voltage  | Vcc    | 0   | 3.6 | V     |                          |
| Input Voltage         | ---    | GND | Vcc | V     |                          |
| Output Current        | Iout   | 0   | 30  | mA    |                          |

#### Recommended Operating Conditions

| Parameter             | Symbol | Min | Typ  | Max  | Units                |
|-----------------------|--------|-----|------|------|----------------------|
| Power Supply Voltage  | Vcc    | 3.1 | 3.3  | 3.5  | V                    |
| Operating Temperature | Topr   | 0   |      | 70   | °C / air flow 1m/sec |
| Data Rate             |        |     | 1250 | 1300 | Mb/s                 |
| Power Supply Current  | Icc    |     | 200  | 280  | mA                   |

#### Transmitter Specifications (0°C < Topr < 70°C, 3.1V < Vcc < 3.5V)

| Parameter                   | Symbol                                                             | Min           | Typ       | Max           | Units | Notes             |
|-----------------------------|--------------------------------------------------------------------|---------------|-----------|---------------|-------|-------------------|
| <b>Optical</b>              |                                                                    |               |           |               |       |                   |
| Optical Transmit Power      | Po                                                                 | 0             | ---       | -5            | dBm   | 1                 |
| Output Center Wavelength    | $\lambda$                                                          | $\lambda-5.5$ | $\lambda$ | $\lambda+7.5$ | nm    | 2                 |
| Output Spectrum Width       | $\Delta\lambda$                                                    | ---           | ---       | 1             | nm    | -20 dB Width      |
| Side Mode Suppression Ratio | SMSR                                                               | 30            |           |               | dB    |                   |
| Extinction Ratio            | ER                                                                 | 9             | ---       | ---           | dB    |                   |
| Output Eye                  | Compliant with Bellcore TR-NWT-000253 and ITU recommendation G.957 |               |           |               |       |                   |
| Optical Rise Time           | tr                                                                 |               |           | 0.26          | ns    | 20% to 80% Values |
| Optical Fall Time           | tf                                                                 |               |           | 0.26          | ns    | 20% to 80% Values |
| Relative Intensity Noise    | RIN                                                                |               |           | -120          | dB/Hz |                   |
| Total Jitter                | TJ                                                                 |               |           | 0.227         | ns    | 3                 |
| <b>Electrical</b>           |                                                                    |               |           |               |       |                   |
| Data Input Current – Low    | IL                                                                 | -350          |           |               | μA    |                   |
| Data Input Current – High   | I <sub>H</sub>                                                     |               |           | 350           | μA    |                   |
| Differential Input Voltage  | V <sub>IH</sub> - V <sub>IL</sub>                                  | 300           |           |               | mV    |                   |
| Data Input Voltage – Low    | V <sub>IL</sub> - V <sub>CC</sub>                                  | -2.0          |           | -1.58         | V     | 4                 |
| Data Input Voltage -- High  | V <sub>IH</sub> - V <sub>CC</sub>                                  | -1.1          |           | -0.74         | V     | 4                 |

Notes: 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. Measured with a 2<sup>7</sup>-1 PRBS.

4. These inputs are compatible with 10K, 10KH and 100K ECL and LVPECL inputs.

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| Receiver Specifications (0°C < Topr < 70°C, 3.1V < Vcc < 3.5V) |                                   |      |     |       |       |                         |
|----------------------------------------------------------------|-----------------------------------|------|-----|-------|-------|-------------------------|
| Parameter                                                      | Symbol                            | Min  | Typ | Max   | Units | Notes                   |
| <b>Optical</b>                                                 |                                   |      |     |       |       |                         |
| Sensitivity                                                    | ---                               | ---  | --- | -24   | dBm   | 1                       |
| Maximum Input Power                                            | Pin                               | -3   |     | ---   | dBm   |                         |
| 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    |                         |
| <b>Electrical</b>                                              |                                   |      |     |       |       |                         |
| Data Output Voltage – Low                                      | V <sub>OL</sub> - V <sub>CC</sub> | -2.0 |     | -1.58 | V     | 2                       |
| Data Output Voltage – High                                     | V <sub>OH</sub> - V <sub>CC</sub> | -1.1 |     | -0.74 | V     | 2                       |
| Signal Detect Output Voltage -- Low                            | V <sub>OL</sub> - V <sub>CC</sub> | -2.0 |     | -1.58 | V     | OPN-S8G133-3D24FC       |
| Signal Detect Output Voltage -- High                           | V <sub>OH</sub> - V <sub>CC</sub> | -1.1 |     | -0.74 | V     |                         |
| Signal Detect Output Voltage -- Low                            | V <sub>SDL</sub>                  |      |     | 0.5   | V     | OPN-S8G133T-3D24FC      |
| Signal Detect Output Voltage -- High                           | V <sub>SDH</sub>                  | 2.0  |     |       | V     |                         |

Notes: 1. Minimum sensitivity and saturation levels at BER=1E-12 for a 2<sup>7</sup>-1 PRBS at ER=9 dB.

2. These outputs are compatible with 10K, 10KH and 100K ECL and PECL outputs.

## CONNECTION DIAGRAM

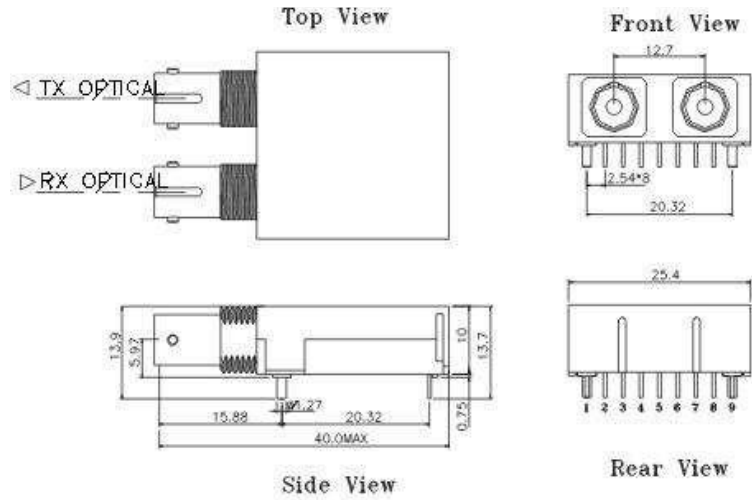
|                           |            |          |     |
|---------------------------|------------|----------|-----|
| Receiver Signal Ground    | 1 (Rx GND) |          | ○   |
| Receiver Data Out         | 2 (RD+)    |          | N/C |
| Receiver Data Out Bar     | 3 (RD-)    |          |     |
| Signal Detect             | 4 (SD)     |          |     |
| Receiver Power Supply     | 5 (Rx Vcc) | TOP VIEW |     |
| Transmitter Power Supply  | 6 (Tx Vcc) |          |     |
| Transmitter Data In Bar   | 7 (TD-)    |          |     |
| Transmitter Data In       | 8 (TD+)    |          | N/C |
| Transmitter Signal Ground | 9 (Tx GND) |          | ○   |

| PIN | Symbol | Notes                                                     |
|-----|--------|-----------------------------------------------------------|
| 1   | Rx GND | Directly connect this pin to the receiver ground plane    |
| 2   | RD+    | See recommended circuit schematic                         |
| 3   | RD-    | See recommended circuit schematic                         |
| 4   | SD     | Active high on this indicates a received optical signal   |
| 5   | Rx Vcc | +3.3V dc power for the receiver section                   |
| 6   | Tx Vcc | +3.3V dc power for the transmitter section                |
| 7   | TD-    | See recommended circuit schematic                         |
| 8   | TD+    | See recommended circuit schematic                         |
| 9   | Tx GND | Directly connect this pin to the transmitter ground plane |



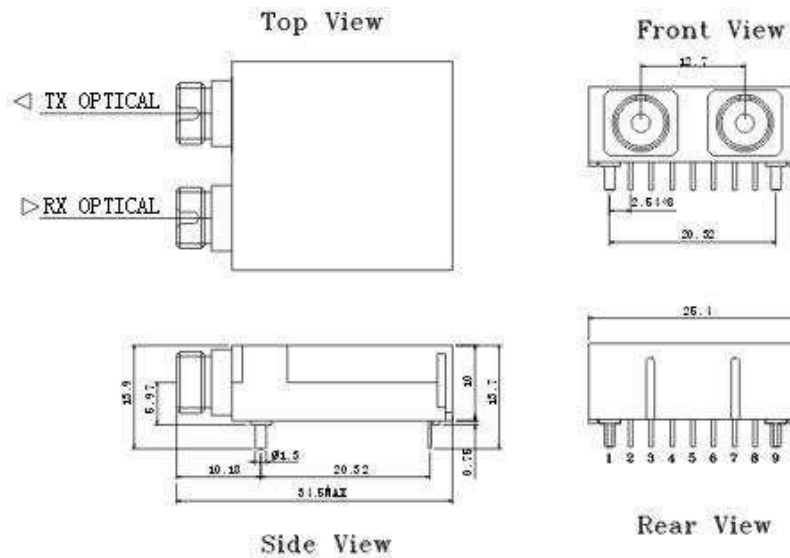
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### 2) ST Type



OPN-S8G133-3D24ST / OPN-S8G133T-3D24ST

### 3) FC Type



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**Note:** Specifications subject to change without notice.