

# DATA SHEET

# NEC

# LASER DIODE NDL7910P

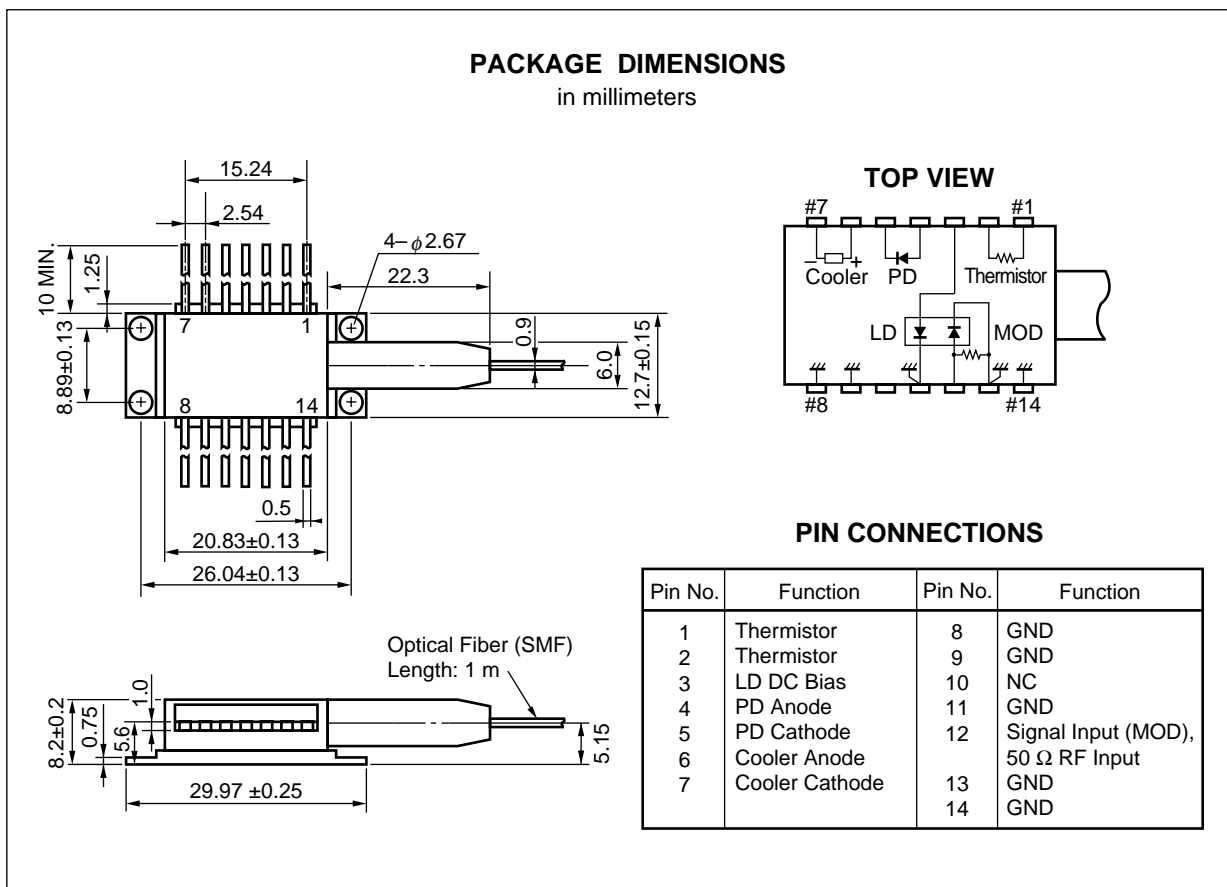
## 1 550 nm OPTICAL FIBER COMMUNICATIONS EA MODULATOR INTEGRATED MQW-DFB LASER DIODE MODULE FOR 2.5 Gb/s ULTRALONG-REACH APPLICATIONS

### DESCRIPTION

The NDL7910P is an EA modulator integrated 1 550 nm DFB-LD for 2.5 Gb/s. The newly developed bandgap energy controlled Selective MOVPE technology is utilized as fabrication method. It is designed for 2.5 Gb/s ultralong-reach applications.

### FEATURES

- Integrated electroabsorption modulator
- Low modulation voltage
- Wavelength selectable for ITU-T standards
- 14-pin butterfly package



The information in this document is subject to change without notice.

**ORDERING INFORMATION**

| Part Number | Available Connector  |
|-------------|----------------------|
| NDL7910P    | Without Connector    |
| NDL7910PC   | With FC-PC Connector |

**ABSOLUTE MAXIMUM RATINGS (T<sub>c</sub> = 25 °C, unless otherwise specified)**

| Parameter                         | Symbol            | Ratings    | Unit |
|-----------------------------------|-------------------|------------|------|
| Optical Output Power from Fiber   | P <sub>f</sub>    | 10         | mW   |
| Forward Current of LD             | I <sub>FLD</sub>  | 150        | mA   |
| Reverse Voltage of LD             | V <sub>RLD</sub>  | 2.0        | V    |
| Forward Voltage of Modulator      | V <sub>Fm</sub>   | 1          | V    |
| Reverse Voltage of Modulator      | V <sub>Rm</sub>   | 5          | V    |
| Forward Current of PD             | I <sub>FPD</sub>  | 1          | mA   |
| Reverse Voltage of PD             | V <sub>RPD</sub>  | 10         | V    |
| Cooler Current                    | I <sub>c</sub>    | 1.5        | A    |
| Cooler Voltage                    | V <sub>c</sub>    | 2.5        | V    |
| Operating Case Temperature        | T <sub>c</sub>    | -20 to +70 | °C   |
| Storage Temperature               | T <sub>stg</sub>  | -40 to +85 | °C   |
| Lead Soldering Temperature (10 s) | T <sub>slid</sub> | 260        | °C   |

**ELECTRO-OPTICAL CHARACTERISTICS**

(T<sub>LD</sub> = 25 °C, T<sub>c</sub> = -20 to +70 °C, unless otherwise specified)

| Parameter                       | Symbol            | Conditions   | MIN.  | TYP. | MAX.  | Unit |
|---------------------------------|-------------------|--|-------|------|-------|------|
| Operating Current               | I <sub>op</sub>   |  | 50    |      | 100   | mA   |
| ★ Modulation Center Voltage     | V <sub>Rmc</sub>  |  | 0.5   |      | 1.5   | V    |
| Modulation Voltage              | V <sub>Rmpp</sub> |  | 2     |      | 3     | V    |
| Forward Voltage of LD           | V <sub>FLD</sub>  | I <sub>FLD</sub> = I <sub>op</sub>   |       |      | 1.8   | V    |
| Threshold Current               | I <sub>th</sub>   |  |       | 7    | 20    | mA   |
| Optical Output Power from Fiber | P <sub>f</sub>    | V <sub>Rm</sub> = 0 V, I <sub>FLD</sub> = I <sub>op</sub>                                  | 0.5   |      |       | mW   |
| Peak Emission Wavelength        | λ <sub>p</sub>    | I <sub>FLD</sub> = I <sub>op</sub> , V <sub>Rm</sub> = 0 V                                 | 1 545 |      | 1 560 | nm   |
| Spectral Line Width             | ΔV                | I <sub>FLD</sub> = I <sub>op</sub> , -20 dB, Under modulation <sup>*1</sup>                |       | 4    |       | GHz  |
| Side Mode Suppression Ratio     | SMSR              | I <sub>FLD</sub> = I <sub>op</sub> , V <sub>Rm</sub> = 0 V                                 | 30    |      |       | dB   |
| Extinction Ratio                | ER                | I <sub>FLD</sub> = I <sub>op</sub> , Under modulation <sup>*1</sup>                        | 10    |      |       | dB   |
| Cut-off Frequency               | f <sub>c</sub>    | I <sub>FLD</sub> = I <sub>op</sub> , V <sub>Rm</sub> = 1/2 V <sub>Rmpp</sub> , -3 dB, 50 Ω | 3.2   |      |       | GHz  |
| Rise Time                       | t <sub>r</sub>    | I <sub>FLD</sub> = I <sub>op</sub> , 20-80 %, Under modulation <sup>*1</sup>               |       |      | 125   | ps   |
| Fall Time                       | t <sub>f</sub>    | I <sub>FLD</sub> = I <sub>op</sub> , 80-20 %, Under modulation <sup>*1</sup>               |       |      | 125   | ps   |
| Isolation                       | I <sub>s</sub>    |  | 30    |      |       | dB   |

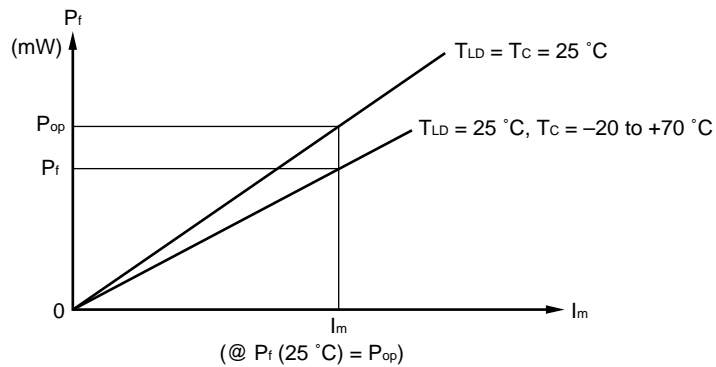
\*1 2.48832 Gb/s, PRBS 2<sup>23-1</sup>, V<sub>Rm</sub> = V<sub>Rmc</sub> ± 1/2 V<sub>Rmpp</sub>, NEC Test System

**ELECTRO-OPTICAL CHARACTERISTICS**

(Applicable to Monitor PD: T<sub>LD</sub> = 25 °C, T<sub>c</sub> = -20 to +70 °C)

| Parameter           | Symbol          | Conditions   | MIN. | TYP. | MAX.  | Unit |
|---------------------|-----------------|--|------|------|-------|------|
| Monitor Current     | I <sub>m</sub>  | I <sub>FLD</sub> = I <sub>op</sub> , V <sub>Rm</sub> = 0 V | 20   |      | 1 000 | μA   |
| Dark Current        | I <sub>D</sub>  | V <sub>RPD</sub> = 5 V                                     |      |      | 10    | nA   |
| Tracking Error      | γ <sup>*1</sup> | I <sub>m</sub> = const.                                    |      |      | 0.5   | dB   |
| Monitor Capacitance | C <sub>t</sub>  | V <sub>RPD</sub> = 5 V, f = 1 MHz                          |      |      | 15    | pF   |

$$*1 \gamma = \left| 10 \log \frac{P_f}{P_{op}} \right|$$



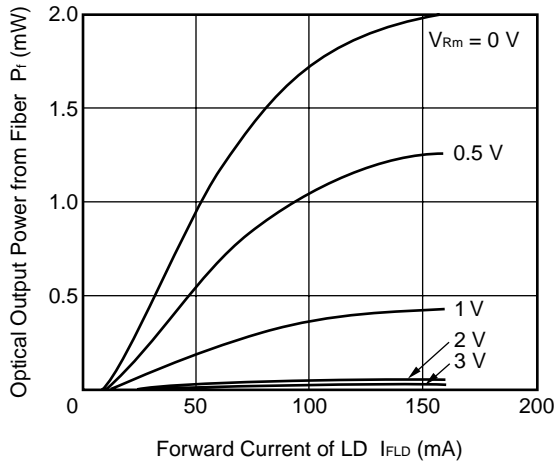
**ELECTRO-OPTICAL CHARACTERISTICS**

(Applicable to Thermistor and TEC: T<sub>LD</sub> = 25 °C, T<sub>c</sub> = -20 to +70 °C)

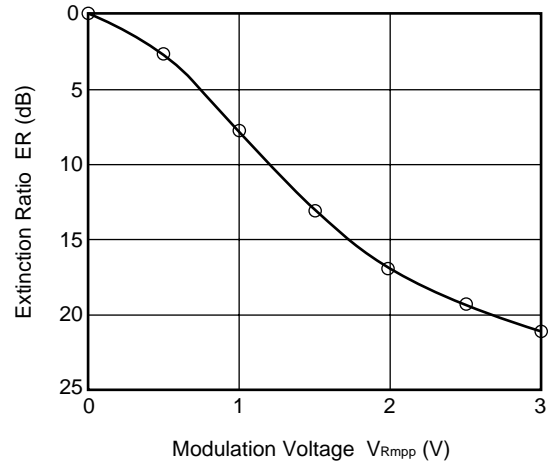
| Parameter             | Symbol         | Conditions                 | MIN.  | TYP.  | MAX.  | Unit |
|-----------------------|----------------|----------------------------|-------|-------|-------|------|
| Thermistor Resistance | R              | T <sub>LD</sub> = 25 °C    | 9.5   | 10.0  | 10.5  | kΩ   |
| B Constant            | B              |                            | 3 300 | 3 400 | 3 500 | K    |
| Cooler Current        | I <sub>c</sub> | ΔT = 70 - T <sub>set</sub> |       |       | 1.5   | A    |
| Cooler Voltage        | V <sub>c</sub> | ΔT = 70 - T <sub>set</sub> |       |       | 2.5   | V    |

**TYPICAL CHARACTERISTICS ( $T_{LD} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)**

OPTICAL OUTPUT POWER FROM FIBER vs. FORWARD CURRENT OF LD (CW)



EXTINCTION RATIO vs. MODULATION VOLTAGE (CW)



**Remark** The graphs indicate nominal characteristics.

★ DFB-LD FAMILY FOR TELECOM

| Part Number     | Absolute Maximum Ratings |                          | Typical Characteristics |                        |                        | SDH Application   | Package |
|-----------------|--------------------------|--------------------------|-------------------------|------------------------|------------------------|---|---------|
|                 | T <sub>c</sub><br>(°C)   | T <sub>stg</sub><br>(°C) | I <sub>th</sub><br>(mA) | P <sub>r</sub><br>(mW) | λ <sub>c</sub><br>(nm) |   |         |
|                 |                          |                          | TYP.                    | MIN.                   | TYP.                   |   |         |
| NDL7603P Series | -40 to +85               | -40 to +85               | 15                      | 2                      | 1 310                  | ≤ STM-4 : 622 Mb/s                                      | Coaxial |
| NDL7620P Series | 0 to +70                 | -40 to +85               | 45 (MAX.)               | 2                      | 1 310                  | ≤ STM-16: 2.5 Gb/s                                      | Coaxial |
| NDL7701P Series | -20 to +85               | -40 to +85               | 15                      | 2                      | 1 550                  | ≤ STM-4 : 622 Mb/s                                      | Coaxial |
| NDL7705P Series | -40 to +85               | -40 to +85               | 15                      | 2                      | 1 550                  | ≤ STM-4 : 622 Mb/s                                      | Coaxial |
| NX8562LB        | -20 to +65               | -40 to +85               | 20                      | 20                     | 1 550 <sup>*1</sup>    | CW Light Source for external modulator                  | BFY     |
| NX8563LB Series | -20 to +65               | -40 to +85               | 20                      | 10                     | ITU-T <sup>*2</sup>    | CW Light Source for external modulator                  | BFY     |
| NDL7910P        | -20 to +70               | -40 to +85               | 7                       | 0.5                    | 1 550 <sup>*1</sup>    | ≤ STM-16: 2.5 Gb/s<br>EA modulator<br>integrated DFB-LD | BFY     |

\*1 Wavelength selectable for ITU-T standards upon request.

\*2 Wavelength selectable for ITU-T standards.

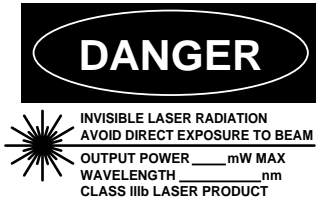
**REFERENCE**

| Document Name   | Document No. |
|---|--------------|
| NEC semiconductor device reliability/quality control system | C11159E      |
| Quality grades on NEC semiconductor devices                 | C11531E      |
| Semiconductor device mounting technology manual             | C10535E      |
| Semiconductor selection guide                               | X10679E      |

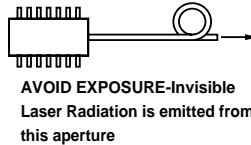
[MEMO]

CAUTION

Within this device there exists GaAs (Gallium Arsenide) material which is a harmful substance if ingested. Please do not under any circumstances break the hermetic seal.



SEMICONDUCTOR LASER



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 Minato-ku, Tokyo 108-01, Japan

Type number: \_\_\_\_\_  
 Manufactured: \_\_\_\_\_  
 Serial Number: \_\_\_\_\_

This product conforms to FDA  
 regulations as applicable  
 to standards 21 CFR Chapter 1.  
 Subchapter J.

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Anti-radioactive design is not implemented in this product.