DATA SHEET

NEC

LASER DIODE

# NX8563LB

## 1 550 nm InGaAsP MQW-DFB LASER DIODE MODULE CW LIGHT SOURCE FOR DWDM APPLICATIONS

### DESCRIPTION

The NX8563LB is a 1 550 nm Multiple Quantum Well (MQW) structured Distributed Feed-Back (DFB) laser diode module with Polarization Maintain Fiber (PMF).

It is designed as Continuous Wave (CW) light source and ideal for optical transmission systems with external modulators. The device is available for Dense Wavelength Division Multiplexing (DWDM) wavelengths based on ITU-T recommendations, enabling a wide range of applications.

### FEATURES

- Output power $P_f$ = 10 mW MIN.
- Available for DWDM wavelengths based on ITU-T recommendations (100 GHz grid, refer to the ORDERING INFORMATION)
- Internal thermo-electric cooler and isolator
- Hermetically sealed 14-pin butterfly package
- Polarization maintain fiber pigtail



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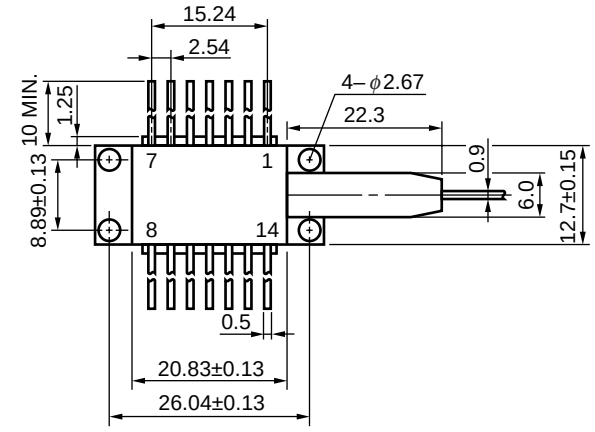
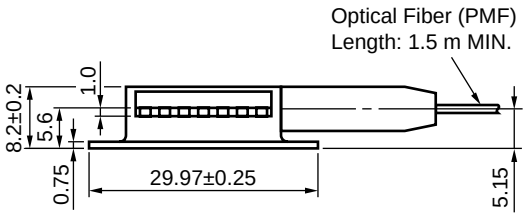
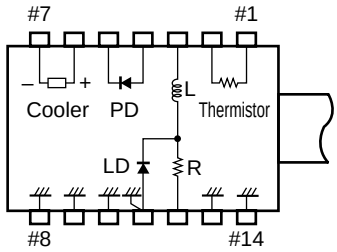
**The mark ★ shows major revised points.**

★ **PACKAGE DIMENSIONS (UNIT: mm)**



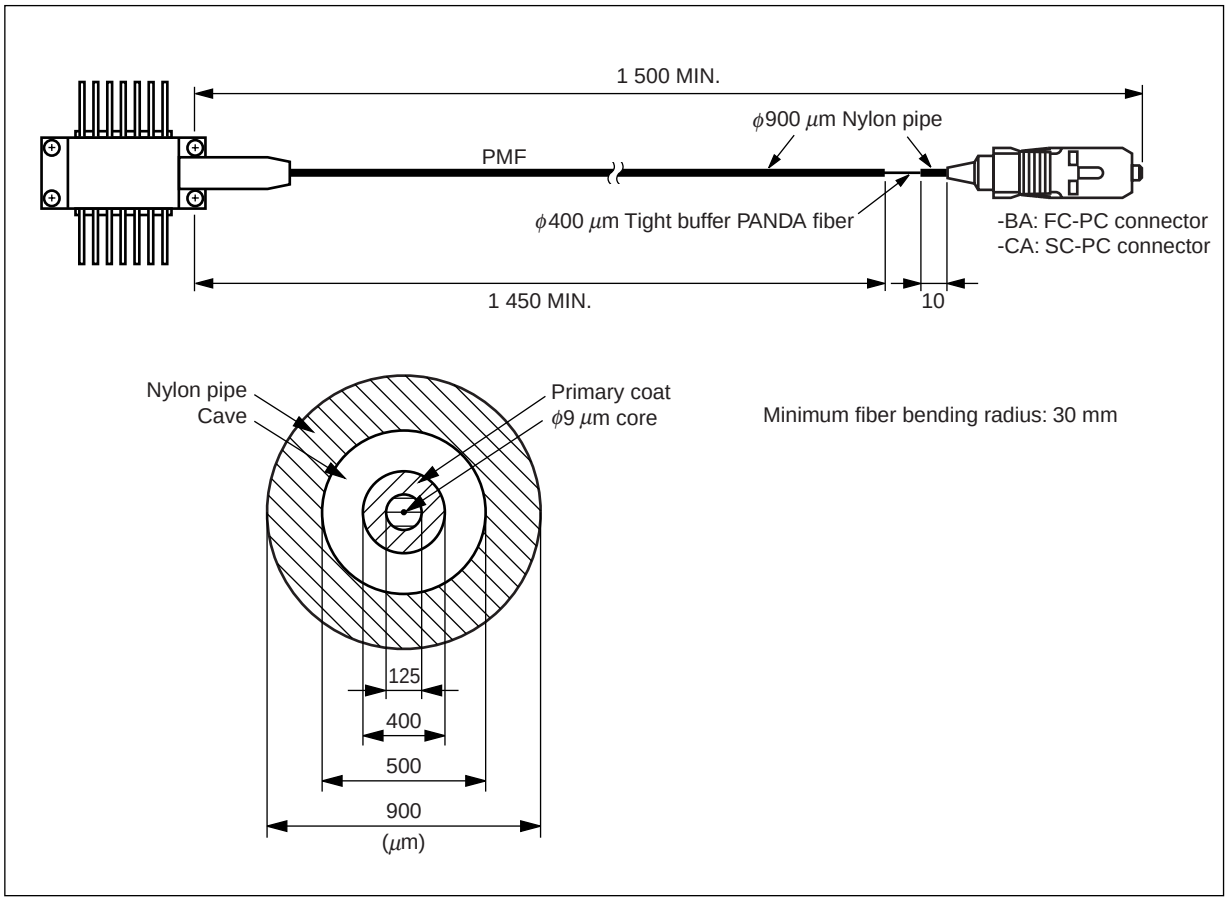

**TOP VIEW**




**PIN CONNECTIONS**

| Pin No. | Function | Pin No. | Function |
|---|---|---|---|
| 1 | Thermistor | 8 | GND |
| 2 | Thermistor | 9 | GND |
| 3 | Bias | 10 | GND |
| 4 | PD Anode | 11 | GND, LD Anode |
| 5 | PD Cathode | 12 | Signal Input |
| 6 | Cooler Anode | 13 | GND |
| 7 | Cooler Cathode | 14 | GND |

★ **OPTICAL FIBER DIMENSIONS (UNIT: mm)**



## ORDERING INFORMATION

| Part Number | | | ITU-T Wavelength*1 | Frequency |
|---|---|---|---|---|
| Without Connector | With FC-PC Connector | With SC-PC Connector | (nm) | (THz) |
| NX8563LB279 | NX8563LB279-BA | NX8563LB279-CA | 1527.99 | 196.20 |
| NX8563LB287 | NX8563LB287-BA | NX8563LB287-CA | 1528.77 | 196.10 |
| NX8563LB295 | NX8563LB295-BA | NX8563LB295-CA | 1529.55 | 196.00 |
| NX8563LB303 | NX8563LB303-BA | NX8563LB303-CA | 1530.33 | 195.90 |
| NX8563LB311 | NX8563LB311-BA | NX8563LB311-CA | 1531.11 | 195.80 |
| NX8563LB318 | NX8563LB318-BA | NX8563LB318-CA | 1531.89 | 195.70 |
| NX8563LB326 | NX8563LB326-BA | NX8563LB326-CA | 1532.68 | 195.60 |
| NX8563LB334 | NX8563LB334-BA | NX8563LB334-CA | 1533.46 | 195.50 |
| NX8563LB342 | NX8563LB342-BA | NX8563LB342-CA | 1534.25 | 195.40 |
| NX8563LB350 | NX8563LB350-BA | NX8563LB350-CA | 1535.03 | 195.30 |
| NX8563LB358 | NX8563LB358-BA | NX8563LB358-CA | 1535.82 | 195.20 |
| NX8563LB366 | NX8563LB366-BA | NX8563LB366-CA | 1536.60 | 195.10 |
| NX8563LB373 | NX8563LB373-BA | NX8563LB373-CA | 1537.39 | 195.00 |
| NX8563LB381 | NX8563LB381-BA | NX8563LB381-CA | 1538.18 | 194.90 |
| NX8563LB389 | NX8563LB389-BA | NX8563LB389-CA | 1538.97 | 194.80 |
| NX8563LB397 | NX8563LB397-BA | NX8563LB397-CA | 1539.76 | 194.70 |
| NX8563LB405 | NX8563LB405-BA | NX8563LB405-CA | 1540.55 | 194.60 |
| NX8563LB413 | NX8563LB413-BA | NX8563LB413-CA | 1541.34 | 194.50 |
| NX8563LB421 | NX8563LB421-BA | NX8563LB421-CA | 1542.14 | 194.40 |
| NX8563LB429 | NX8563LB429-BA | NX8563LB429-CA | 1542.93 | 194.30 |
| NX8563LB437 | NX8563LB437-BA | NX8563LB437-CA | 1543.73 | 194.20 |
| NX8563LB445 | NX8563LB445-BA | NX8563LB445-CA | 1544.52 | 194.10 |
| NX8563LB453 | NX8563LB453-BA | NX8563LB453-CA | 1545.32 | 194.00 |
| NX8563LB461 | NX8563LB461-BA | NX8563LB461-CA | 1546.11 | 193.90 |
| NX8563LB469 | NX8563LB469-BA | NX8563LB469-CA | 1546.91 | 193.80 |
| NX8563LB477 | NX8563LB477-BA | NX8563LB477-CA | 1547.71 | 193.70 |
| NX8563LB485 | NX8563LB485-BA | NX8563LB485-CA | 1548.51 | 193.60 |
| NX8563LB493 | NX8563LB493-BA | NX8563LB493-CA | 1549.31 | 193.50 |
| NX8563LB501 | NX8563LB501-BA | NX8563LB501-CA | 1550.11 | 193.40 |
| NX8563LB509 | NX8563LB509-BA | NX8563LB509-CA | 1550.91 | 193.30 |
| NX8563LB517 | NX8563LB517-BA | NX8563LB517-CA | 1551.72 | 193.20 |
| NX8563LB525 | NX8563LB525-BA | NX8563LB525-CA | 1552.52 | 193.10 |
| NX8563LB533 | NX8563LB533-BA | NX8563LB533-CA | 1553.32 | 193.00 |
| NX8563LB541 | NX8563LB541-BA | NX8563LB541-CA | 1554.13 | 192.90 |

***1** The value which omitted and computed the 3rd place below the decimal point

| Part Number | | | ITU-T Wavelength*1 | Frequency |
|---|---|---|---|---|
| Without Connector | With FC-PC Connector | With SC-PC Connector | (nm) | (THz) |
| NX8563LB549 | NX8563LB549-BA | NX8563LB549-CA | 1554.94 | 192.80 |
| NX8563LB557 | NX8563LB557-BA | NX8563LB557-CA | 1555.74 | 192.70 |
| NX8563LB565 | NX8563LB565-BA | NX8563LB565-CA | 1556.55 | 192.60 |
| NX8563LB573 | NX8563LB573-BA | NX8563LB573-CA | 1557.36 | 192.50 |
| NX8563LB581 | NX8563LB581-BA | NX8563LB581-CA | 1558.17 | 192.40 |
| NX8563LB589 | NX8563LB589-BA | NX8563LB589-CA | 1558.98 | 192.30 |
| NX8563LB597 | NX8563LB597-BA | NX8563LB597-CA | 1559.79 | 192.20 |
| NX8563LB606 | NX8563LB606-BA | NX8563LB606-CA | 1560.60 | 192.10 |
| NX8563LB614 | NX8563LB614-BA | NX8563LB614-CA | 1561.41 | 192.00 |
| NX8563LB622 | NX8563LB622-BA | NX8563LB622-CA | 1562.23 | 191.90 |
| NX8563LB630 | NX8563LB630-BA | NX8563LB630-CA | 1563.04 | 191.80 |
| NX8563LB638 | NX8563LB638-BA | NX8563LB638-CA | 1563.86 | 191.70 |
| NX8563LB646 | NX8563LB646-BA | NX8563LB646-CA | 1564.67 | 191.60 |
| NX8563LB654 | NX8563LB654-BA | NX8563LB654-CA | 1565.49 | 191.50 |

***1** The value which omitted and computed the 3rd place below the decimal point

## ABSOLUTE MAXIMUM RATINGS

| Parameter | Symbol | Ratings | Unit |
|---|---|---|---|
| Forward Current of LD | $I_F$ | 300 | mA |
| Reverse Voltage of LD | $V_R$ | 2.0 | V |
| Forward Current of PD | $I_F$ | 10 | mA |
| Reverse Voltage of PD | $V_R$ | 20 | V |
| Operating Case Temperature | $T_C$ | −20 to +65 | °C |
| Storage Temperature | $T_{stg}$ | −40 to +85 | °C |
| Lead Soldering Temperature | $T_{sld}$ | 260 (10 sec.) | °C |

## ELECTRO-OPTICAL CHARACTERISTICS ($T_{LD}$ = 25 °C, $T_C$ = –20 to +65 °C)

| Parameter | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Laser Set Temperature | $T_{set}$ | | 20 | | 35 | °C |
| Forward Voltage | $V_F$ | $P_f$ = 10 mW | 0.9 | | 1.5 | V |
| Threshold Current | $I_{th}$ | | | 20 | 40 | mA |
| Optical Output Power from Fiber | $P_f$ | $I_F$ = 167 mA, $T_{LD}$ = $T_{set}$ | 10 | | | mW |
| Threshold Output Power | $P_{th}$ | $I_F$ = $I_{th}$ | | | 100 | μW |
| Quantum Efficiency | $\eta$ | | 0.08 | 0.1 | | W/A |
| Peak Emission Wavelength | $\lambda_p$ | $P_f$ = 10 mW, CW, $T_{LD}$ = $T_{set}$ | 1527.6 | ITU-T*1 | 1565.6 | nm |
| Spectral Line Width | $\Delta\nu$ | $P_f$ = 10 mW, CW, 3 dB down | | 1 | 2 | MHz |
| Side Mode Suppression Ratio | SMSR | $P_f$ = 10 mW, CW | 30 | 35 | | dB |
| FM Response | $\eta_{FM}$ | $P_f$ = 10 mW | 50 | 70 | | MHz/mA |
| Relative Intensity Noise | RIN | $P_f$ = 10 mW, 20 MHz to 3 GHz | | | –150 | dB/Hz |
| Flat frequency response | $f_m$ | $P_f$ = 10 mW, +/–3 dB | 1.8 | | | GHz |
| Polarization Extinction Ratio*2 | ext | $P_f$ = 10 mW, CW | 15 | 20 | | dB |

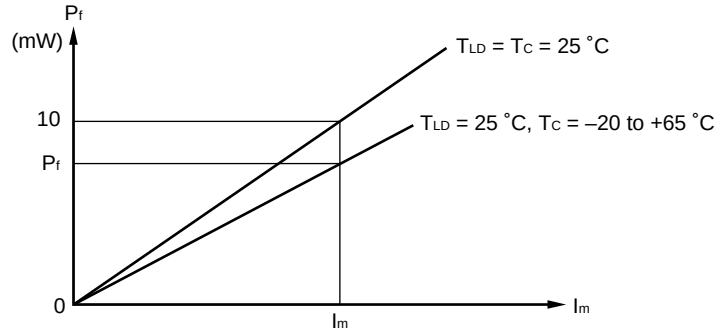
***1** Available for DWDM wavelengths based on ITU-T recommendation.
Please refer to the ORDERING INFORMATION.

***2** Polarization state of LD is aligned parallel to the slow axis.

## ELECTRO-OPTICAL CHARACTERISTICS
## (Applicable to Monitor PD: $T_{LD}$ = 25 °C, $T_C$ = –20 to +65 °C)

| Parameter | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Monitor Current | $I_m$ | $P_f$ = 10 mW, $V_R$ = 5 V | 100 | | 2 000 | $\mu$A |
| Dark Current | $I_D$ | $V_R$ = 5 V | | 2 | 10 | nA |
| Tracking Error | $\gamma$ *1 | $I_m$ = const. | | | 0.5 | dB |

***1** $\gamma = \left| 10 \log \frac{P_f}{10 \text{ mW}} \right|$



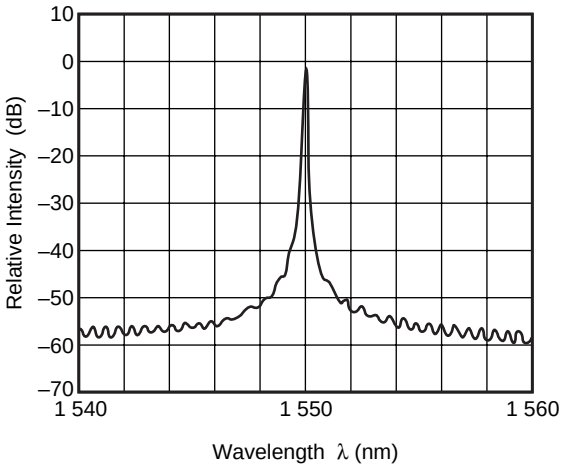

(@ $P_f$ (25 ˚C) = 10 mW)

## ELECTRO-OPTICAL CHARACTERISTICS
## (Applicable to Thermistor and TEC: $T_{LD}$ = 25 °C, $T_C$ = –20 to +65 °C)

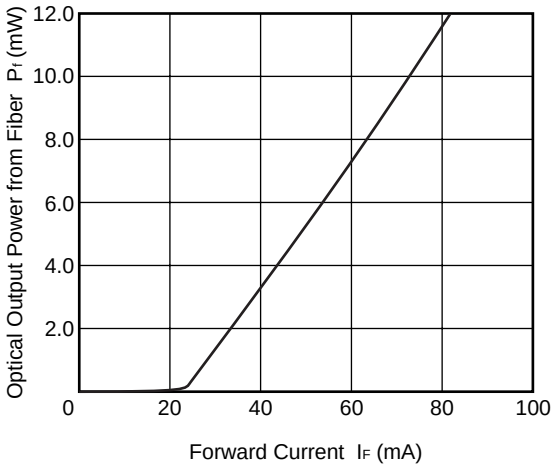
| Parameter | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Thermistor Resistance | R | $T_{LD}$ = 25 °C | 9.5 | 10.0 | 10.5 | kΩ |
| B Constant | B | | 3 350 | 3 450 | 3 550 | K |
| Cooler Current | $I_C$ | $\Delta T = 65 - T_{set}$, $P_f$ = 10 mW | | | 1.0 | A |
| Cooler Voltage | $V_C$ | $\Delta T = 65 - T_{set}$, $P_f$ = 10 mW | | | 2.0 | V |

**TYPICAL CHARACTERISTICS ($T_C$ = 25 °C, unless otherwise specified)**

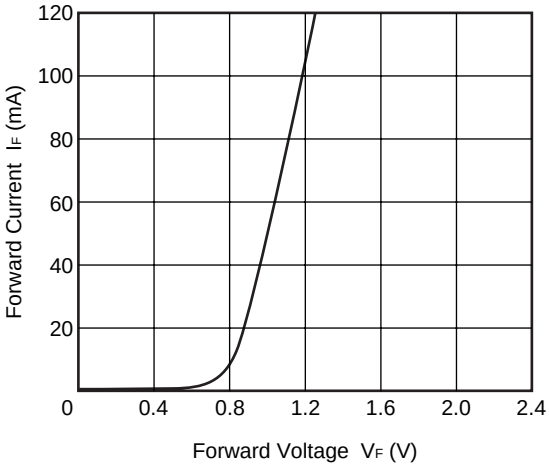
LONGITUDINAL MODE



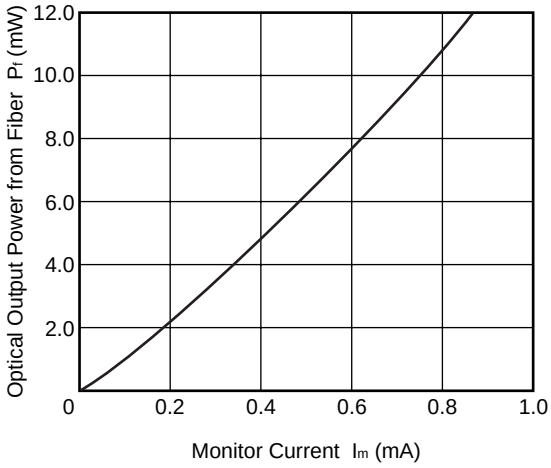

OPTICAL OUTPUT POWER FROM FIBER vs. FORWARD CURRENT



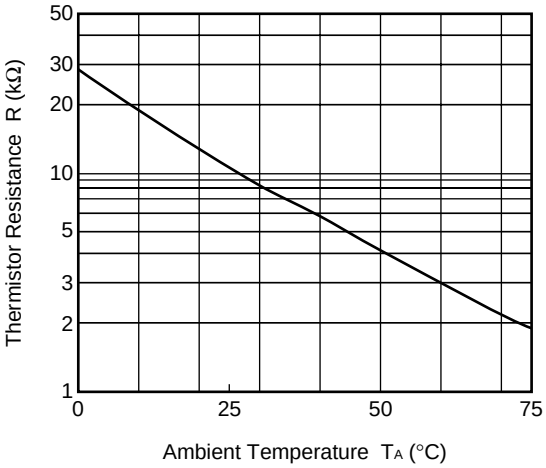

FORWARD CURRENT vs. FORWARD VOLTAGE




OPTICAL OUTPUT POWER FROM FIBER vs. MONITOR CURRENT




THERMISTOR RESISTANCE vs. AMBIENT TEMPERATURE




**Remark** The graphs indicate nominal characteristics.

**DFB-LD FAMILY**

| Part Number | Absolute Maximum Ratings | | Electro-Optical Characteristics ($T_C$ = 25 °C) | | | Application | Package |
|---|---|---|---|---|---|---|---|
| | $T_C$ (°C) | $T_{stg}$ (°C) | $I_{th}$ (mA) | $P_f$ (mW) | $\lambda_p$ (nm) | | |
| | | | TYP. | MIN. | TYP. | | |
| NX8300BE-CC<br>NX8300CE-CC | 0 to +75 | −40 to +85 | 15 | 2*1 | 1 310 | 2.5 Gb/s: STM-16<br>(S-16.1, L-16.1) | Coaxial |
| NX8303BG-CC | −10 to +85 | −40 to +85 | 15 | 2*1 | 1 310 | 622 Mb/s: STM-4 (L-4.1) | Coaxial |
| NX8503BG-CC | −10 to +85 | −40 to +85 | 15 | 2*1 | 1 550 | 156 Mb/s: STM-1<br>(L-1.2, L-1.3) | Coaxial |
| | | | | | | 622 Mb/s: STM-4<br>(L-4.2, L-4.3) | |
| NX8504BE-CC<br>NX8504CE-CC | −10 to +85 | −40 to +85 | 15 | 2*1 | 1 550 | 622 Mb/s: STM-4<br>(L-4.2, L-4.3) | Coaxial |
| ★ NX8560LJ-CC | −20 to +70 | −40 to +85 | 6 | −2 dBm | 1 550*2 | ≤ 10 Gb/s: STM-64 | BFY with GPO |
| NX8562LB | −20 to +65 | −40 to +85 | 20 | 20 | 1 550*2 | CW Light Source for external modulator | BFY |
| NX8563LB | −20 to +65 | −40 to +85 | 20 | 10 | 1 550*2 | CW Light Source for external modulator | BFY |
| NX8564LE-CC | −20 to +70 | −40 to +85 | 7 | 0.6*1 | 1 550*2 | 2.5 Gb/s: STM-16<br>EA modulator integrated | BFY |
| NX8565LE-CC | −20 to +70 | −40 to +85 | 7 | 0.6*1 | 1 550*2 | 2.5 Gb/s: STM-16<br>EA modulator integrated | BFY |
| NX8570SA | −20 to +70 | −40 to +85 | 20 | 20 | 1 550*2 | CW Light Source with λ monitoring PD | BFY |

***1** TYP.

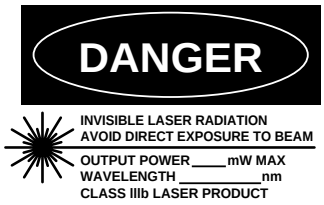
***2** Available for DWDM Wavelength based on ITU-T recommendation

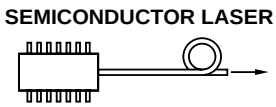
## REFERENCE

| 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 Products & Packages (CD-ROM) | X13769X |

## 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.**

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**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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