

## Pigtailed Analog DFB-LD TBDxxx4 Series



- 1310nm/1550nm InGaAsP LD
- DFB Laser with Optical Isolator
- SMQW Structure
- SMF Pigtailed, SC or FC Connector

### Family Model

TBDx204    TBDx304

### Features

- 1.31 $\mu$ m/1.55 $\mu$ m InGaAsP SMQW DFB laser diode
- Low threshold, high slope efficiency and high output power LD
- Cost-effective uncooled laser diode
- Operating temperature ; -20 $^{\circ}$ C to +85 $^{\circ}$ C
- Single-mode fiber pigtailed with SC or FC connector
- Tested by TERADIAN's Reliability and Qualification Program

### Description

The TBDxxxx series, pigtailed coaxial LD module consists of an uncooled, reliable strained MQW InGaAsP laser(DFB) and a back-facet InGaAs PIN photodiode.

The parts of pigtailed LD module – single-mode fiber, lens and laser diode - are actively aligned by high power YAG laser welding method. This packaging guarantees high coupling efficiency, high slope efficiency, low operating current and low tracking error over a wide temperature range (-20 $^{\circ}$ C to +85 $^{\circ}$ C).

### Applications

- Wireless fiber-optic repeaters
- Analog and digital modulation systems
- Video link

## Absolute Maximum Ratings

| Parameters                    | Symbol    | Unit   | Min.     | Max.     | Remarks                     |
|-------------------------------|-----------|--------|----------|----------|-----------------------------|
| Ambient Operating Temperature | $T_{op}$  | °C     | 0<br>-20 | 70<br>85 | Indoor Use<br>Extended Temp |
| Storage Temperature           | $T_{stg}$ | °C     | -40      | 85       |                             |
| Forward Current(LD)           | $I_{FL}$  | mA     | -        | 150      |                             |
| Reverse Voltage(LD)           | $V_{RL}$  | V      | -        | 2        |                             |
| Reverse Current(mPD)          | $I_{RP}$  | mA     | -        | 2        |                             |
| Reverse Voltage(mPD)          | $V_{RP}$  | V      | -        | 15       |                             |
| Lead Soldering Temp./Time     |           | °C/sec |          | 260/10   |                             |

## Electrical and Optical Characteristics

(T<sub>op</sub> = 25°C)

| Parameters                         | Symbol          | Condition  | Unit      | Min.         | Typ.         | Max.         | Remarks                |
|------------------------------------|-----------------|--|-----------|--------------|--------------|--------------|------------------------|
| Threshold Current                  | $I_{th}$        | CW   | mA        |              | 8<br>10      | 15<br>15     | TLD3XXX<br>TLD5XXX     |
| Operating Current                  | $I_{op}$        | CW, @P <sub>f</sub>  | mA        |              |              | 40           |                        |
| Forward Voltage                    | $V_f$           | CW, @P <sub>f</sub>  | V         |              |              | 1.6          |                        |
| Optical Output Power               | $P_f$           | CW,<br>I <sub>op</sub> = I <sub>th</sub> +20mA                   | mW        |              | 2.0<br>3.0   |              | TBDX204<br>TBDX304     |
| Slope Efficiency                   | $\eta$          | CW,@P <sub>f</sub>   | mW/<br>mA | 0.08<br>0.12 | 0.10<br>0.15 |              | TBDX204<br>TBDX304     |
| Thermal Slope Efficiency           | $T_\eta$        | CW,<br>T <sub>η</sub> (T)/T <sub>η</sub> (25°C)<br>T = -20~+85°C |           | 0.5          |              |              |                        |
| Peak Wavelength                    | $\lambda_c$     | CW, @P <sub>f</sub>  | nm        | 1290<br>1530 | 1310<br>1550 | 1330<br>1570 | TBD3XX4<br>TBD5XX4     |
| Spectral Linewidth                 | $\Delta\lambda$ | CW, @P <sub>f</sub>  | nm        |              |              | 1            |                        |
| Side Mode Suppression Ratio        | SMSR            | CW   | dB        | 30           |              |              |                        |
| Wavelength Temperature Coefficient | -               | CW, @P <sub>f</sub>  | nm/°<br>C | 0.07         | 0.1          | 0.12         |                        |
| Tracking Error                     | $\gamma$        | APC, T <sub>c</sub> =0~+70°C<br>or -20~+85°C                     | dB        | -1.0         |              | 1.0          | I <sub>m</sub> =const. |
| Optical Isolation                  | ISO             |  | dB        | 30           |              |              |                        |
| Dark Current(m-PD)                 | $I_D$           | V <sub>RP</sub> =5V  | nA        |              | 1            | 10           |                        |
| Monitor Current(m-PD)              | $I_m$           | V <sub>RP</sub> =5V, @P <sub>f</sub>                             | mA        | 0.08         |              |              |                        |
| Capacitance(m-PD)                  |                 | V <sub>RP</sub> =5V, f=1MHz                                      | pF        |              |              | 10           |                        |

## RF Characteristics

( $T_{op} = 25^{\circ}C$ )

| Parameters                        | Symbol     | Condition   | Unit      | Min. | Typ. | Max. | Remark |
|-----------------------------------|------------|---|-----------|------|------|------|--------|
| Relative Intensity Noise          | RIN        | CW, @ $P_f$ ,<br>Freq.=5MHz to 2.3GHz   | dB/<br>Hz |      |      | -145 |        |
| Modulation Bandwidth <sup>1</sup> | $f_{-3dB}$ | CW, @ $P_f$   | GHz       | 2.6  |      |      |        |
| RF Bandpass Flatness              | BF         | Peak to valley, 5MHz to<br>2.3GHz   | dB        |      |      | 1.0  |        |
| Second-order Distortion           | IMD2       | @ $P_f$ , $P_{rfin}=0dBm/CH$ , Two-<br>tone test: $f_1=829MHz$ ,<br>$f_2=831MHz$ , $f_1 \pm f_2$                                  | dBc       |      |      | -40  |        |
| Third-orderd Distortion           | IMD3       | @ $P_f$ , $P_{rfin}=0dBm/CH$ , Two-<br>tone test: $f_1=829MHz$ ,<br>$f_2=831MHz$ , and also<br>$f_1=1800MHz$ ,<br>$f_2=1802.5MHz$ | dBc       |      |      | -60  |        |

1. Modulation bandwidth was measured with impedance matched to  $50\Omega$  and TO-Can lead 2.0mm-long left after being cut off.

### ! Handling Caution

The LD module can be damaged by overvoltage and current surges. Precautions should be taken for transient power supply.

This device is susceptible to damage as a result of electrostatic discharge(ESD). Take proper precautions during both handling and testing

The stress to the fiber pigtail may cause the damage on the performance. The fiber pigtail may snap off by dropping the module.

### Laser Eye Safety

These LD modules have laser semiconductor product and are classified as AEL Class IIIb per U.S. FDA/CDRH 21CFR 1040 and class 3a per EN60825-1. These products comply with 21CFR, Chapter 1, Subchapter J( 21CFR 1040.10 and 1040.11 laser safety requirements).

### Laser Data

Wavelength :      nm(Model : ) /      nm(Model : )

Measured Output power :      mW(1310nm) /      mW(1550nm)

Limited Power :      mW(1310nm) /      nW(1550nm)

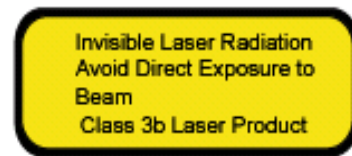
**Caution**

On operation, if optical connectors are unterminated, modules can emit invisible laser radiation. Radiation emitted by laser devices can be dangerous to the eyes. Avoided eye or skin exposure to direct or scattered radiation



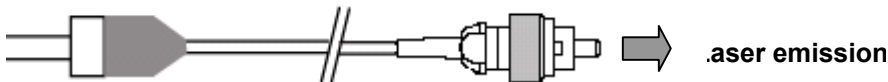
INVISIBLE LASER RADIATION  
AVOID DIRECT EXPOSURE TO BEAM

Maximum Output Power : mW  
Wavelength : nm  
CLASS IIIb LASER PRODUCT



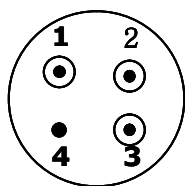
Ref : IEC60825

AVOID EXPOSURE - Invisible Laser radiation is emitted from this aperture.

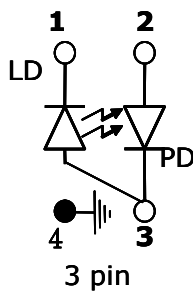


**Pin Descriptions**

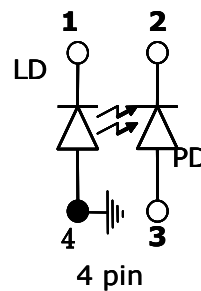
| Pin No. | Description           |                        |
|---------|-----------------------|------------------------|
|         | 3 pin type            | 4 pin type             |
| 1       | LD cathode            | LD cathode             |
| 2       | Backfacet PD anode    | Backfacet PD cathode   |
| 3       | LD anode & PD cathode | Backfacet PD anode     |
| 4       | Case ground           | LD anode & Case ground |



Bottom view



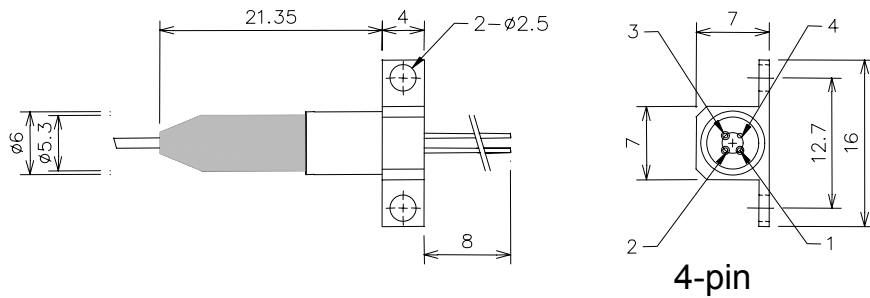
3 pin



4 pin

### Outline Diagram

- TBDx20x-xxxH, TBDx30x-xxxH



- TBDx20x-xxxV, TBDx30x-xxxV

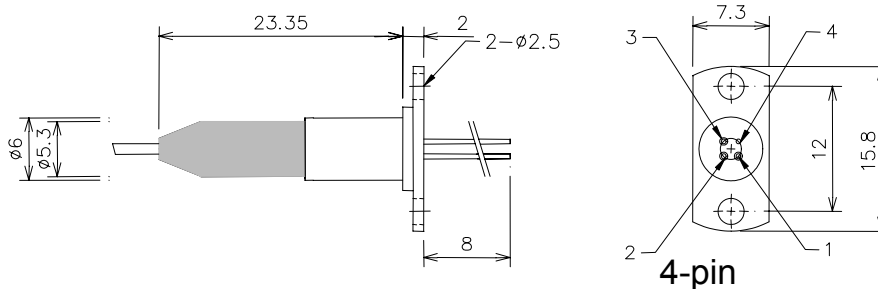


Fig.3 TBD series Dimensions [unit: mm]

### Ordering Information

| Company  | Device Type                                |                               | Wave-length                           | Supply Voltage                         | Pin                                | Temp. Range   | Fiber          | Connector   | Flange  |
|----------|--|-------------------------------|---------------------------------------|--|------------------------------------|---|----------------|---|---|
| T        | B  | D                             | 3                                     | 20                                     | 4                                  | E   | S              | S   | N   |
| Teradial | <b>B</b> ; Analog App. (Wireless Repeater) | <b>D</b> ;DFB (with isolator) | <b>3</b> ; 1.3μm<br><b>5</b> ; 1.55μm | <b>20</b> ; 2.0mW<br><b>30</b> ; 3.0mW | <b>3</b> ; 3pin<br><b>4</b> ; 4pin | <b>I</b> ; Indoor Use (0~70℃)<br><b>E</b> ; Extended Temp (-20~85℃) | <b>S</b> ; SMF | <b>N</b> ; None<br><b>S</b> ; SC<br><b>F</b> ; FC<br><b>T</b> ; ST<br><b>L</b> ; LC | <b>N</b> ; None<br><b>V</b> ; Vertical<br><b>H</b> ; Horizontal |

\*Note 1 ; additional order information

- Connector type default is SC/APC and the default length of fiber is 1m

### More Information

#### Teradian Inc.

Address 946, Dunsan-dong, Seo-gu, Daejeon, 302-120, Korea  
 Tel +82-42-476-4800, 4803(Oversea Sales Team)  
 Fax +82-42-476-4805  
 Homepage <http://www.teradian.com>  
 e-mail [sales@teradian.com](mailto:sales@teradian.com)