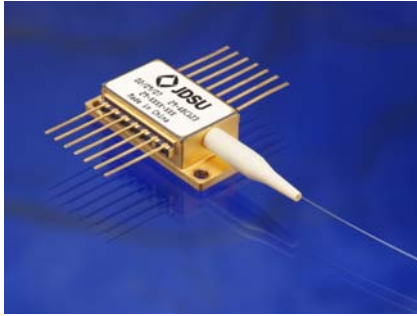


## Up to 500 mW Fiber Bragg Grating Stabilized 980 nm Pump Modules 2900 Series



### Key Features

- Very high kink-free powers to 500 mW
- Low-profile, epoxy-free, and flux-free 14-pin butterfly planar package with PM fiber
- Fiber Bragg grating stabilization
- Wavelength selection available
- Integrated thermoelectric cooler, thermistor, and monitor diode
- High dynamic range
- Excellent low power stability

### Applications

- Next generation dense wavelength division multiplexing (DWDM) erbium doped fiber amplifiers (EDFAs) requiring the highest power with “locked” wavelength emission
- Reduced pump-count EDFA architectures
- Very long distance cable television (CATV) trunks and very high node count distribution

The JDSU 2900 Series 980 nm pump module utilizes a planar construction with chip on subcarrier. The high power JDSU laser chip is hermetically sealed in a low-profile, epoxy- and flux-free 14-pin butterfly package and fitted with a thermistor, thermoelectric cooler, and monitor diode. This product uses a polarization maintaining fiber (PMF) pigtail that allows excellent side mode suppression ratios (SMSR) over a very wide dynamic range.

The 2900 Series pump module uses PM fiber Bragg grating stabilization to “lock” the emission wavelength. It provides a noise-free narrowband spectrum, even under changes in temperature, drive current, and optical feedback. Wavelength selection is available for applications that require the highest performance in spectrum control with the highest available powers.

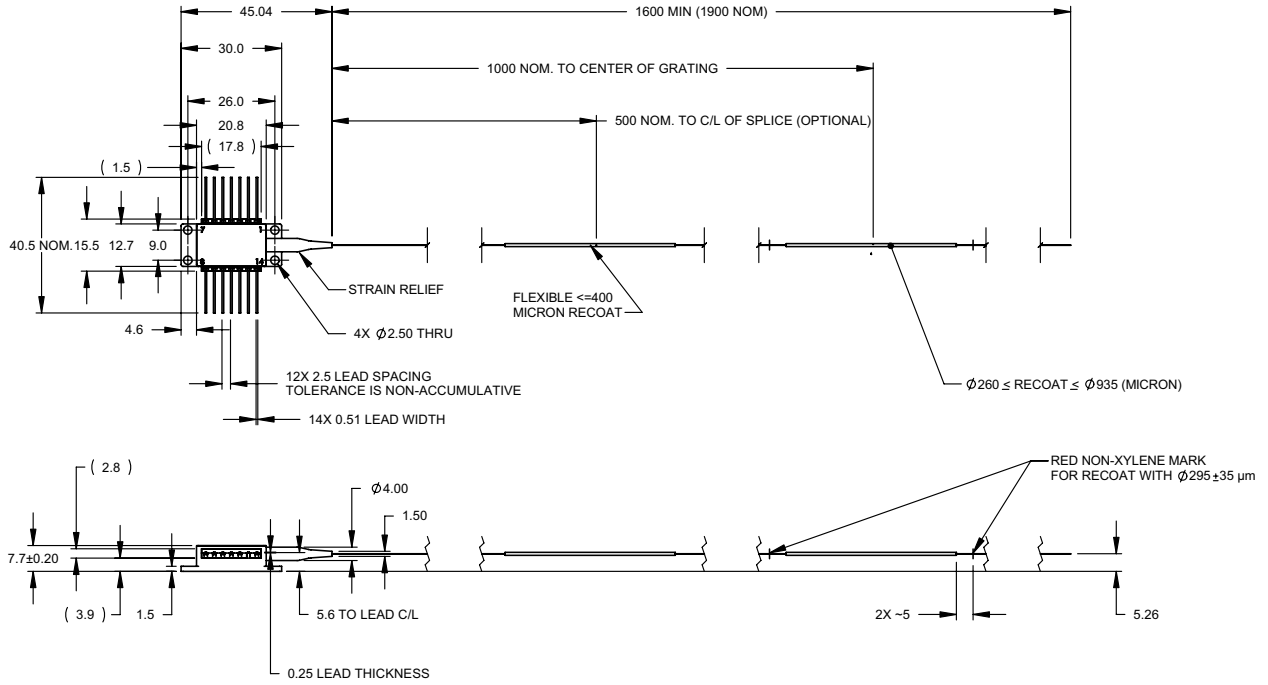
### Compliance

- Telcordia GR-468-CORE

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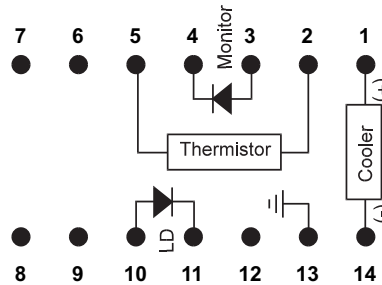
Dimensions Diagram

(Note: Specifications in mm unless otherwise noted; tolerance = .x ± .3, .xx ± .20.)



Pinout

| Pin | Description        |
|-----|--------------------|
| 1   | Cooler (+)         |
| 2   | Thermistor         |
| 3   | Monitor PD anode   |
| 4   | Monitor PD cathode |
| 5   | Thermistor         |
| 6   | N/C                |
| 7   | N/C                |
| 8   | N/C                |
| 9   | N/C                |
| 10  | Laser anode        |
| 11  | Laser cathode      |
| 12  | N/C                |
| 13  | Case ground        |
| 14  | Cooler (-)         |



## 3

## Absolute Maximum Ratings

| Parameter                     | Symbol             | Test Condition                          | Minimum | Maximum    |
|-------------------------------|--------------------|---|---------|------------|
| Operating case temperature    | T <sub>op</sub>    | -                                       | -5 °C   | 75 °C      |
| Storage temperature           | T <sub>stg</sub>   | 2000 hours                              | -40 °C  | 85 °C      |
| Laser operating temperature   | T <sub>LD</sub>    | -                                       | 0 °C    | 50 °C      |
| LD reverse voltage            | V <sub>r</sub>     | -                                       | -       | 2.5 V      |
| LD forward current            | I <sub>f_max</sub> | 48 hours maximum                        | -       | 1100 mA    |
| LD reverse current            |                    | -                                       | -       | 10 μA      |
| PD reverse voltage            | V <sub>PD</sub>    | -                                       | -       | 20 V       |
| PD forward current            | I <sub>PF</sub>    | -                                       | -       | 10 mA      |
| Electrostatic discharge (ESD) | V <sub>ESD</sub>   | C = 100 pF, R = 1.5 Ω, human body model | -       | 1000 V     |
| Cooler current                | I <sub>C</sub>     | -                                       | -       | 4 A        |
| TEC voltage                   | V <sub>C</sub>     | -                                       | -       | 4.5 V      |
| Axial pull force              |                    | 3 x 10 seconds                          | -       | 5 N        |
| Side pull force               |                    | 3 x 10 seconds                          | -       | 2.5 N      |
| Fiber bend radius             |                    | -                                       | 16 mm   | -          |
| Atmospheric pressure          |                    |   |         |            |
| Storage                       |                    |   | -       | 11 kPa     |
| Operating                     |                    |   | -       | 58 kPa     |
| Relative humidity             | R <sub>H</sub>     | Non condensing                          | 5%      | 95%        |
| Lead soldering time           |                    | 260 °C                                  | -       | 10 seconds |

Note: Each device is rated to a maximum kink-free current (I<sub>max</sub>), provided on the individual datasheet. This is the maximum current under which the device will perform its intended function. Operation above I<sub>max</sub>, and up to the absolute maximum rating, may result in poor device performance, and degrade device reliability. Long-term operation above I<sub>max</sub> may lead to early device failure.

## Operating Parameters

| Product Code | Operating Power<br>Pop (mW) | Operating Current<br>I <sub>op</sub> (mA) | Kink-Free Power<br>P <sub>max</sub> (mW) | Kink-Free Current<br>I <sub>max</sub> (mA) |
|--------------|-----------------------------|---|--|--|
| 29-xxxx-310  | 280                         | 555                                       | 310                                      | 615  |
| 29-xxxx-320  | 290                         | 575                                       | 320                                      | 635  |
| 29-xxxx-330  | 300                         | 595                                       | 330                                      | 655  |
| 29-xxxx-340  | 310                         | 615                                       | 340                                      | 680  |
| 29-xxxx-350  | 315                         | 625                                       | 350                                      | 700  |
| 29-xxxx-360  | 325                         | 645                                       | 360                                      | 720  |
| 29-xxxx-380  | 340                         | 680                                       | 380                                      | 760  |
| 29-xxxx-400  | 360                         | 720                                       | 400                                      | 805  |
| 29-xxxx-420  | 380                         | 760                                       | 420                                      | 855  |
| 29-xxxx-440  | 400                         | 805                                       | 440                                      | 910  |
| 29-xxxx-460  | 410                         | 840                                       | 460                                      | 950  |
| 29-xxxx-480  | 430                         | 875                                       | 480                                      | 985  |
| 29-xxxx-500  | 450                         | 900                                       | 500                                      | 1000                                       |

## 4

## Available Peak Wavelength Selection

| Product Code | Peak Wavelength | Peak Wavelength Tolerance |
|--------------|-----------------|---------------------------|
| 29-7402-xxx  | 974.0 nm        | ±1 nm                     |
| 29-7552-xxx  | 975.5 nm        | ±1 nm                     |
| 29-7602-xxx  | 976.0 nm        | ±1 nm                     |
| 29-7702-xxx  | 977.0 nm        | ±1 nm                     |
| 29-8000-xxx  | 980.0 nm        | -6/+5 nm                  |
| 29-8052-xxx  | 980.5 nm        | ±1 nm                     |

## Electro-Optical Performance

(BOL,  $T_{\text{case}} = 0$  to  $75\text{ }^{\circ}\text{C}$ ,  $P_{\text{f}}$  range = 12 mW to  $P_{\text{max}}$ , -50 dB reflection, unless noted otherwise)

| Parameter                         | Symbol                       | Test Condition  | Minimum               | Maximum                     |
|-----------------------------------|------------------------------|---|-----------------------|-----------------------------|
| Threshold current                 | $I_{\text{th-BOL}}$          | -   | -                     | 30 mA                       |
| Laser diode temperature           | $T_{\text{LD}}$              | -   | 20 $^{\circ}\text{C}$ | 30 $^{\circ}\text{C}$       |
| Forward voltage                   | $V_{\text{f}}$               | $I_{\text{f}} = I_{\text{op}}$  | -                     | 2.5 V                       |
| Operating power                   | $P_{\text{op}}$              | $I_{\text{f}} = I_{\text{op}}$  | 12 mW                 | 450 mW                      |
| Kinkfree output power             | $P_{\text{max}}$             | $I_{\text{f}} = I_{\text{max}}$   | 310 mW                | 500 mW                      |
| Wavelength                        | $\lambda_{\text{m}}$         | $T_{\text{ambient}} = 22 \pm 3\text{ }^{\circ}\text{C}$   | 973 nm                | 986 nm                      |
| Pump in pump band                 | $P_{\text{pump}}$            | Pump band = $\lambda_{\text{m}} \pm 1.5\text{ nm}$  | 90%                   | -                           |
| Spectral width                    | $\Delta\lambda_{\text{RMS}}$ | -   | -                     | 2.0 nm                      |
| Wavelength tuning vs. temperature | $\Delta\lambda/T$            | -   | -                     | 0.02 nm/ $^{\circ}\text{C}$ |
| Relative optical power stability  |                              | Peak-to-peak, $T = 10\text{ min}$ ,<br>50 kHz sampling, $T_{\text{case}} = 25\text{ }^{\circ}\text{C}$<br>$20\text{ mW} < P < P_{\text{op}}$<br>$12\text{ mW} < P < 20\text{ mW}$ | -<br>-                | 4%<br>10%                   |
| Monitor diode responsivity        | $I_{\text{BF}}$              | -   | 2 $\mu\text{A/mW}$    | 20 $\mu\text{A/mW}$         |
| TEC cooling capacity              | $\Delta T_{\text{TEC}}$      | $I_{\text{f}} = I_{\text{max}}$ , $T_{\text{LD}} = 25\text{ }^{\circ}\text{C}$ , see table on next page   | 50 $^{\circ}\text{C}$ | -                           |
| Thermistor resistance             | $R_{\text{th}}$              | $T_{\text{set}} = 25\text{ }^{\circ}\text{C}$   | 9.5 k $\Omega$        | 10.5 k $\Omega$             |
| Thermistor constant               | B                            | -   | 3600 K                | 4200 K                      |

## 5

**TEC and Total Module Power Consumption**(For  $\Delta T = 50\text{ }^{\circ}\text{C}$ , BOL,  $T_{\text{case}} = 75\text{ }^{\circ}\text{C}$ ,  $T_{\text{ld}} = 25\text{ }^{\circ}\text{C}$  unless noted otherwise)

| Product Code | TEC Current<br>$I_{\text{max}}$ (A) | TEC Voltage<br>$V_{\text{max}}$ (V) | TEC Power Consumption<br>$P_{\text{max}}$ (W) | Total Module Power<br>Consumption $P_{\text{max}}$ (W) |
|--------------|-------------------------------------|-------------------------------------|---|--|
| 29-xxxx-310  | 1.35                                | 1.95                                | 2.63  | 3.80   |
| 29-xxxx-320  | 1.40                                | 2.00                                | 2.80  | 4.00   |
| 29-xxxx-330  | 1.45                                | 2.20                                | 3.19  | 4.57   |
| 29-xxxx-340  | 1.45                                | 2.25                                | 3.26  | 4.70   |
| 29-xxxx-350  | 1.50                                | 2.30                                | 3.45  | 4.91   |
| 29-xxxx-360  | 1.50                                | 2.30                                | 3.45  | 4.97   |
| 29-xxxx-380  | 1.60                                | 2.40                                | 3.84  | 5.40   |
| 29-xxxx-400  | 1.70                                | 2.45                                | 4.17  | 5.86   |
| 29-xxxx-420  | 1.80                                | 2.60                                | 4.70  | 6.52   |
| 29-xxxx-440  | 1.85                                | 2.65                                | 4.90  | 6.82   |
| 29-xxxx-460  | 1.95                                | 2.75                                | 5.36  | 7.36   |
| 29-xxxx-480  | 2.05                                | 2.85                                | 5.84  | 7.94   |
| 29-xxxx-500  | 2.10                                | 2.90                                | 6.00  | 8.20   |

**Panda PM-980 Polarization Maintaining Fiber Nominal Characteristics and Tolerances**

| Parameter                             | Specification                |
|---------------------------------------|------------------------------|
| Cutoff wavelength                     | 950 nm                       |
| Maximum attenuation at 980 nm         | 3.0 dB/km                    |
| Cladding outside diameter             | 125 $\pm$ 3 $\mu\text{m}$    |
| Coating outside diameter              | 250 $\pm$ 3 $\mu\text{m}$    |
| Mode field diameter at 980 nm         | 6.6 $\pm$ 1.1 $\mu\text{m}$  |
| Cross talk at 100 m                   | -25 dBm/2 m                  |
| Maximum beat length                   | 3.3 mm                       |
| Operating temperature                 | -40 to 85 $^{\circ}\text{C}$ |
| Fiber tensile proof strength (tested) | 200 kpsi                     |

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**Ordering Information**

For more information on this or other products and their availability, please contact your local JDSU account manager or JDSU directly at 1-800-498-JDSU (5378) in North America and +800-5378-JDSU worldwide or via e-mail at customer.service@jdsu.com.

**Sample: 29-7402-310**

|             |                        |             |                                |
|-------------|------------------------|-------------|--------------------------------|
| <b>29-</b>  |                        | -           |                                |
| <b>Code</b> | <b>Peak Wavelength</b> | <b>Code</b> | <b>Minimum Kink-Free Power</b> |
| 7402        | 973.0 to 975.0 nm      | 310         | 310 mW                         |
| 7552        | 974.5 to 976.5 nm      | 320         | 320 mW                         |
| 7602        | 975.0 to 977.0 nm      | 330         | 330 mW                         |
| 7702        | 976.0 to 978.0 nm      | 340         | 340 mW                         |
| 8000        | 974.0 to 985.0 nm      | 350         | 350 mW                         |
| 8052        | 979.5 to 981.5 nm      | 360         | 360 mW                         |
|             |                        | 380         | 380 mW                         |
|             |                        | 400         | 400 mW                         |
|             |                        | 420         | 420 mW                         |
|             |                        | 440         | 440 mW                         |
|             |                        | 460         | 460 mW                         |
|             |                        | 480         | 480 mW                         |
|             |                        | 500         | 500 mW                         |

**User Safety**

**Safety and Operating Considerations**

The laser light emitted from this laser diode is invisible and may be harmful to the human eye. Avoid looking directly into the fiber when the device is in operation.

**CAUTION: THE USE OF OPTICAL INSTRUMENTS WITH THIS PRODUCT INCREASES EYE HAZARD.**

Operating the laser diode outside of its maximum ratings may cause device failure or a safety hazard. Power supplies used with this component cannot exceed maximum peak optical power.

CW laser diodes may be damaged by excessive drive current or switching transients. When using power supplies, the laser diode should be connected with the main power on and the output voltage at zero. The current should be increased slowly while monitoring the laser diode output power and the drive current. Careful attention to heatsinking and proper mounting of this device is required to ensure specified performance over its operating life. To maximize thermal transfer to the heatsink, the heatsink mounting surface must be flat to within .001” and the mounting screws must be torqued down to 1.5 in.-lb.

**ESD PROTECTION** — Electrostatic discharge (ESD) is the primary cause of unexpected laser diode failure. Take extreme precaution to prevent ESD. Use wrist straps, grounded work surfaces, and rigorous antistatic techniques when handling laser diodes.

## Labeling

### 21 CFR 1040.10 Compliance

Because of the small size of these devices, the output power and laser emission indicator label shown below is attached to the individual shipping container. All labels are illustrated here to comply with 21 CFR 1040.10 as applicable under the Radiations Control for Health and Safety Act of 1968.

### 14-Pin Module Label



### Shipping Box Label



### Output Power and Laser Emission Indicator Label

