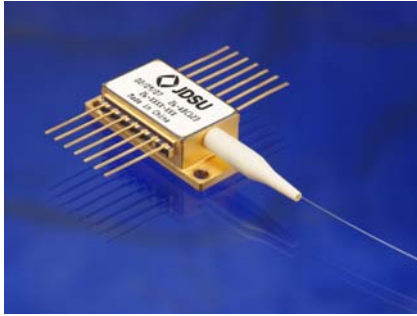


# Up to 180 mW Fiber Bragg Grating Stabilized 980 nm Pump Modules

## 2600 Series

**Key Features**

- High kink-free powers to 180 mW
- Low-profile, epoxy-free, and flux-free 14-PIN butterfly planar package
- Fiber Bragg grating stabilization
- Wavelength selection available
- Integrated thermoelectric cooler, thermistor, and monitor diode
- High dynamic range
- Excellent low power stability

**Applications**

- Dense wavelength division multiplexing (DWDM) EDFAs for small package designs
- High bit rate, high channel count EDFAs
- CATV distribution

**Compliance**

- Telcordia GR-468-CORE

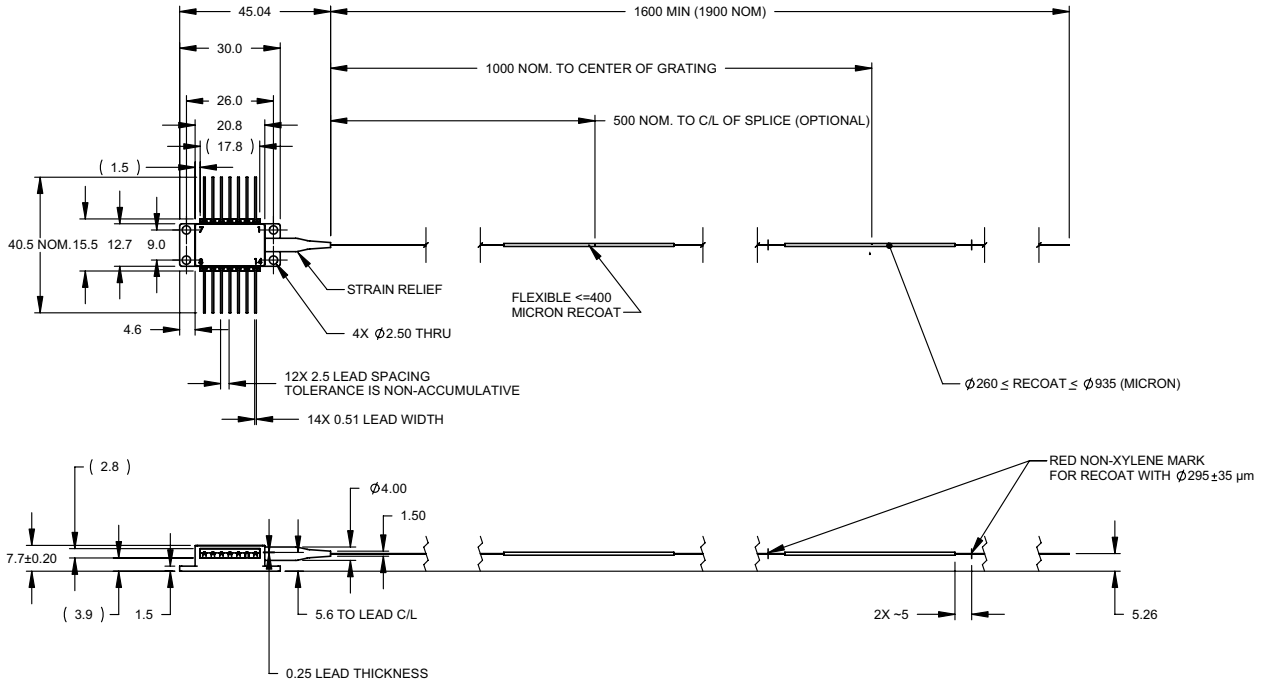
The JDSU 2600 Series of 980 nm pump modules utilizes a planar construction with chip on subcarrier. The high power JDSU laser chip is hermetically sealed in a low-profile, epoxy-free and flux-free 14-pin butterfly package, fitted with a thermistor, thermoelectric cooler, and monitor diode. The module meets the stringent requirements of the telecommunications industry, including Telcordia™ GR-468-CORE for hermetic 980 nm pump modules.

The 2600 Series pump module uses fiber Bragg grating stabilization to “lock” the emission wavelength and provides a noise-free narrowband spectrum, even under changes in temperature, drive current, and optical feedback. Wavelength selection is available for applications requiring the highest performance in spectrum control with the highest powers available.

2

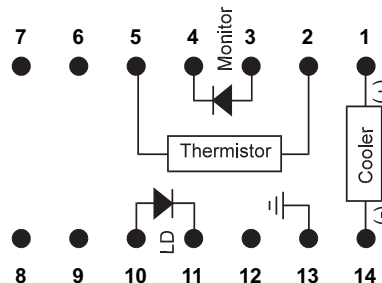
**Dimensions Diagram**  
**250 μm Bare Fiber Type A Wiring**

(Note: Specifications in mm unless otherwise noted; tolerance = .x ± .3, .xx ± .20  
The module pigtail consists of 250 μm buffered, Corning PureMode™ HI-1060 Single-mode fiber.)



**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

**Table 1: Absolute Maximum Ratings**

| Parameter                     | Symbol    | Test Conditions                                     | Minimum | Maximum    |
|-------------------------------|-----------|---|---------|------------|
| Operating case temperature    | $T_{op}$  | -   | -5 °C   | 75 °C      |
| Storage temperature           | $T_{stg}$ | 2000 hours  | -40 °C  | 85 °C      |
| LD submount temperature       | $T_{LD}$  | -   | 0 °C    | 50 °C      |
| LD reverse voltage            | $V_r$     | -   | -       | 2 V        |
| LD forward current            |           | -   | -       | 650 mA     |
| LD current transient          |           | 1 $\mu$ s maximum                                   | -       | 950 mA     |
| LD reverse current            |           | -   | -       | 10 $\mu$ A |
| PD reverse voltage            | $V_{PD}$  | -   | -       | 20 V       |
| PD forward current            | $I_{PD}$  | -   | -       | 10 mA      |
| Electrostatic discharge (ESD) | $V_{ESD}$ | $C = 100$ pF, $R = 1.5$ $\Omega$ , human body model | -       | 1000 V     |
| TEC current                   | $I_{TEC}$ | -   | -       | 2.5 A      |
| TEC voltage                   | $V_{TEC}$ | -   | -       | 4.0 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   | -          |
| Relative humidity             | $R_H$     | 40 °C   | 5%      | 95%        |
| Lead soldering time           |           | 260 °C  | -       | 10 seconds |

Note: Absolute maximum ratings are the maximum stresses that may be applied to the pump module for short periods of time without causing damage. Stresses in excess of the absolute maximum ratings can permanently damage the device. Exposure to absolute maximum ratings for extended periods, or exposure to more than one absolute maximum rating simultaneously may adversely affect device reliability.

**Table 2: Operating Parameters**(BOL,  $T_{case} = 0$  to 75 °C,  $T_{LD} = 25$  °C, -50 dB reflection, unless noted otherwise)

| Product Code <sup>1</sup> | Maximum Operating Power $P_{op}$ (mW) <sup>2,3</sup> | Maximum Operating Current $I_{op}$ (mA) Maximum <sup>2</sup> | Minimum Kink-Free Power $P_{max}$ (mW) <sup>4</sup> | Kink-Free Current $I_{max}$ (mA) <sup>3</sup> Maximum <sup>4</sup> |
|---------------------------|--|--|---|--|
| 26-xxxx-100               | 90   | 240  | 100   | 260  |
| 26-xxxx-110               | 100  | 240  | 110   | 260  |
| 26-xxxx-120               | 110  | 260  | 120   | 270  |
| 26-xxxx-130               | 120  | 270  | 130   | 290  |
| 26-xxxx-140               | 125  | 280  | 140   | 310  |
| 26-xxxx-150               | 135  | 300  | 150   | 330  |
| 26-xxxx-160               | 145  | 320  | 160   | 350  |
| 26-xxxx-170               | 155  | 340  | 170   | 370  |
| 26-xxxx-180               | 160  | 340  | 180   | 380  |

- The 27-xxxx-xxx may be substituted for this part series. All 26-xxxx-xxx end product specifications will remain as published; there is no change to part numbers, product testing, quality or reliability. Traceability is accomplished through product serial number.
- The maximum operating power  $P_{op}$  will be achieved at a device-specific current, the maximum operating current  $I_{op}$ . The individual value of  $I_{op}$  is noted on the hardcopy data sheet shipped with the device. All values of  $I_{op}$  are limited by the maximum value listed in Table 2.
- The pump laser shall never be operated at a power higher than the maximum operating power  $P_{op}$  throughout its lifetime. At Begin of Life (BOL), the operating current shall never be higher than the device-specific maximum operating current  $I_{op}$  that is noted on the hardcopy data sheet shipped with the device. At End of Life (EOL), the operating current shall never be higher than the device-specific kink-free current  $I_{max}$  that is noted on the hardcopy data sheet shipped with the device.
- The module is kink-free (at least) up to a minimum kink-free power  $P_{max}$  that the module will achieve at a device-specific current, the kink-free current  $I_{max}$ . The individual value of  $I_{max}$  is noted on the hardcopy data sheet shipped with the device. All values of  $I_{max}$  are limited by the maximum value listed in Table 2.

## 4

**Table 3: Available Peak Wavelength Selection** $(T_{amb} = 25 \pm 3 \text{ }^\circ\text{C}, 50 \text{ mW} < P < P_{op})$ 

| Product Code | Minimum Peak Wavelength | Maximum Peak Wavelength |
|--------------|-------------------------|-------------------------|
| 26-8000-xxx  | 970.0 nm                | 985.0 nm                |
| 26-7402-xxx  | 973.5 nm                | 975.0 nm                |
| 26-7552-xxx  | 974.5 nm                | 976.5 nm                |
| 26-7602-xxx  | 975.0 nm                | 977.0 nm                |
| 26-7702-xxx  | 976.0 nm                | 978.0 nm                |
| 26-8052-xxx  | 979.5 nm                | 981.5 nm                |

**Table 4: Electro-Optical Performance** $(BOL, T_{case} = 0 \text{ to } 75 \text{ }^\circ\text{C}, T_{LD} = 25 \text{ }^\circ\text{C}, -50 \text{ dB reflection, unless noted otherwise})$ 

| Parameter                        | Symbol                           | Test Condition  | Minimum            | Maximum                   |
|----------------------------------|----------------------------------|---|--------------------|---------------------------|
| Threshold current                | $I_{th}$                         | -   | -                  | 25 mA                     |
| Forward voltage                  | $V_f$                            | $I_f = I_{op}$  | -                  | 2.5 V                     |
| Spectral width                   | $\Delta\lambda_{RMS}$            | $50 \text{ mW} < P < P_{op}$  | -                  | 2.0 nm                    |
| Peak wavelength tuning           | $\Delta\lambda_P/\Delta T_{amb}$ | $50 \text{ mW} < P < P_{op}$  | -                  | 0.02 nm/ $^\circ\text{C}$ |
| Side-mode suppression ratio      | SMSR                             | $50 \text{ mW} < P < P_{op}$  | 15 dB              | -                         |
| Relative optical power stability |                                  | Peak-to-peak, $T = 10 \text{ min}$ ,<br>50 kHz sampling, $T_{case} = 25 \text{ }^\circ\text{C}$ |                    |                           |
|                                  |                                  | $20 \text{ mW} < P < P_{op}$  | -                  | 4%                        |
|                                  |                                  | $12 \text{ mW} < P < 20 \text{ mW}$   | -                  | 10%                       |
|                                  |                                  | $3.5 \text{ mW} < P < 12 \text{ mW}$  | -                  | 25%                       |
| Tracking error                   | TE                               | $20 \text{ mW} < P < P_{op}^1$  | -25%               | 25%                       |
| Tracking ratio                   | TR                               | $20 \text{ mW} < P < P_{op}^2$  | 0.75               | 1.25                      |
| Monitor diode responsivity       | $Resp_{BF}$                      | $20 \text{ mW} < P < P_{op}$  | 2 $\mu\text{A/mW}$ | 10 $\mu\text{A/mW}$       |
| TEC current                      | $I_{TEC}$                        | $T_{case} = 75 \text{ }^\circ\text{C}$  | -                  | 1.5 A                     |
| TEC voltage                      | $V_{TEC}$                        | $T_{case} = 75 \text{ }^\circ\text{C}$  | -                  | 2.5 V                     |
| Thermistor resistance            | $R_{th}$                         | -   | 9.5 k $\Omega$     | 10.5 k $\Omega$           |
| Thermistor constant              | B                                | -   | 3600 K             | 4200 K                    |
| Module power consumption         |                                  | $T_{case} = 75 \text{ }^\circ\text{C}$  | -                  | 4.5 W                     |
|                                  |                                  | $T_{case} = 75 \text{ }^\circ\text{C}, \text{EOL}$  | -                  | 5.0 W                     |

1. The Tracking Error is defined as the normalized change of output power relative to the operating power over case temperature range  $0 \text{ }^\circ\text{C}$  to  $75 \text{ }^\circ\text{C}$ , at constant back face monitor current corresponding to the operating power at  $25 \text{ }^\circ\text{C}$ .
2. The Tracking Ratio is a measure of the front-to-back tracking when the output power is varied. On a plot of optical power versus back-face photocurrent, a straight line is drawn between the minimum power (20 mW) and the operating power  $P_{op}$  points. The tracking ratio is defined as the ratio between measured optical power (shown as data points on the plot) to the value derived from the straight line.

## 5

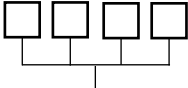
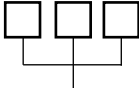
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**Ordering Information**


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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: 26-7402-100**

| <b>26-</b>  <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="text-align: left;">Code</th> <th style="text-align: left;">Peak Wavelength</th> </tr> </thead> <tbody> <tr><td>7402</td><td>973.5 to 975.0 nm</td></tr> <tr><td>7552</td><td>974.5 to 976.5 nm</td></tr> <tr><td>7602</td><td>975.0 to 977.0 nm</td></tr> <tr><td>7702</td><td>976.0 to 978.0 nm</td></tr> <tr><td>8000</td><td>970.0 to 985.0 nm</td></tr> <tr><td>8052</td><td>979.5 to 981.5 nm</td></tr> </tbody> </table> | Code                    | Peak Wavelength | 7402 | 973.5 to 975.0 nm | 7552 | 974.5 to 976.5 nm | 7602 | 975.0 to 977.0 nm | 7702 | 976.0 to 978.0 nm | 8000 | 970.0 to 985.0 nm | 8052 | 979.5 to 981.5 nm | <b>-</b>  <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="text-align: left;">Code</th> <th style="text-align: left;">Minimum Kink-Free Power</th> </tr> </thead> <tbody> <tr><td>100</td><td>100 mW</td></tr> <tr><td>110</td><td>110 mW</td></tr> <tr><td>120</td><td>120 mW</td></tr> <tr><td>130</td><td>130 mW</td></tr> <tr><td>140</td><td>140 mW</td></tr> <tr><td>150</td><td>150 mW</td></tr> <tr><td>160</td><td>160 mW</td></tr> <tr><td>170</td><td>170 mW</td></tr> <tr><td>180</td><td>180 mW</td></tr> </tbody> </table> | Code | Minimum Kink-Free Power | 100 | 100 mW | 110 | 110 mW | 120 | 120 mW | 130 | 130 mW | 140 | 140 mW | 150 | 150 mW | 160 | 160 mW | 170 | 170 mW | 180 | 180 mW |
|--|-------------------------|-----------------|------|-------------------|------|-------------------|------|-------------------|------|-------------------|------|-------------------|------|-------------------|--|------|-------------------------|-----|--------|-----|--------|-----|--------|-----|--------|-----|--------|-----|--------|-----|--------|-----|--------|-----|--------|
| Code   | Peak Wavelength         |                 |      |                   |      |                   |      |                   |      |                   |      |                   |      |                   |  |      |                         |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |
| 7402   | 973.5 to 975.0 nm       |                 |      |                   |      |                   |      |                   |      |                   |      |                   |      |                   |  |      |                         |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |
| 7552   | 974.5 to 976.5 nm       |                 |      |                   |      |                   |      |                   |      |                   |      |                   |      |                   |  |      |                         |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |
| 7602   | 975.0 to 977.0 nm       |                 |      |                   |      |                   |      |                   |      |                   |      |                   |      |                   |  |      |                         |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |
| 7702   | 976.0 to 978.0 nm       |                 |      |                   |      |                   |      |                   |      |                   |      |                   |      |                   |  |      |                         |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |
| 8000   | 970.0 to 985.0 nm       |                 |      |                   |      |                   |      |                   |      |                   |      |                   |      |                   |  |      |                         |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |
| 8052   | 979.5 to 981.5 nm       |                 |      |                   |      |                   |      |                   |      |                   |      |                   |      |                   |  |      |                         |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |
| Code   | Minimum Kink-Free Power |                 |      |                   |      |                   |      |                   |      |                   |      |                   |      |                   |  |      |                         |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |
| 100  | 100 mW                  |                 |      |                   |      |                   |      |                   |      |                   |      |                   |      |                   |  |      |                         |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |
| 110  | 110 mW                  |                 |      |                   |      |                   |      |                   |      |                   |      |                   |      |                   |  |      |                         |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |
| 120  | 120 mW                  |                 |      |                   |      |                   |      |                   |      |                   |      |                   |      |                   |  |      |                         |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |
| 130  | 130 mW                  |                 |      |                   |      |                   |      |                   |      |                   |      |                   |      |                   |  |      |                         |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |
| 140  | 140 mW                  |                 |      |                   |      |                   |      |                   |      |                   |      |                   |      |                   |  |      |                         |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |
| 150  | 150 mW                  |                 |      |                   |      |                   |      |                   |      |                   |      |                   |      |                   |  |      |                         |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |
| 160  | 160 mW                  |                 |      |                   |      |                   |      |                   |      |                   |      |                   |      |                   |  |      |                         |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |
| 170  | 170 mW                  |                 |      |                   |      |                   |      |                   |      |                   |      |                   |      |                   |  |      |                         |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |
| 180  | 180 mW                  |                 |      |                   |      |                   |      |                   |      |                   |      |                   |      |                   |  |      |                         |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |

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**User Safety**


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**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.

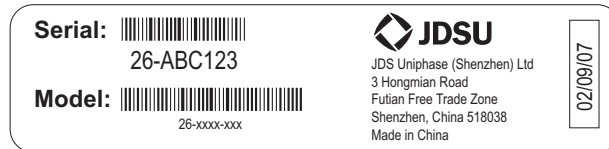
**ESD PROTECTION** — Electrostatic discharge (ESD) is the primary cause of unexpected laser diode failure. Take extreme precaution to prevent ESD. Use wrist straps, grounded work surfaces, and rigorous antistatic techniques when handling laser diodes.

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**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**
