

## 3205/3206 Tunable Laser Assembly



### Key Features



- >35 nm operating range
- 50 GHz channel spacing
- Blanking to -30 dBm during switching
- VOA function
- SBS suppression function
- Narrow linewidth for advanced system applications
- Polarization maintaining fiber pigtail
- Hermetically sealed laser package with integrated optical isolator
- Self-contained microprocessor control and monitor electronics
- I<sup>2</sup>C™, SPI, or UART communication
- Programmable wavelength control supports all C- and L-Bands channels
- Integral wavelength locker for stable operation
- Industry standard Tunable MSA interface

### Applications

- DWDM sparing
- Dynamic wavelength provisioning
- Dynamic add/drop multiplexers
- Optical cross connects
- Wavelength conversion

The JDSU Agile Transmission Modules family includes tunable transponders and tunable lasers. The flexibility enabled by JDSU's transponders is critical to the successful and rapid deployment of next generation, IP-based voice, data and video services which are driving new network management challenges for communications service providers. They also support multiple modulation formats to allow multiple applications, from ultra long haul to metro networks, in a single platform.

The 3205/3206 Widely Tunable Laser Assembly (TLA) is designed for use in DWDM systems where the capability to change wavelength on demand over the entire C- and L- Bands with up to 50 GHz channel spacing is essential.

The key elements of the TLA are the Sampled Grating Distributed Bragg Reflector (SG-DBR) laser, monolithically integrated with a Semiconductor Optical Amplifier (SOA) and an integral wavelength locker, all enclosed in a high-reliability, hermetically sealed package.

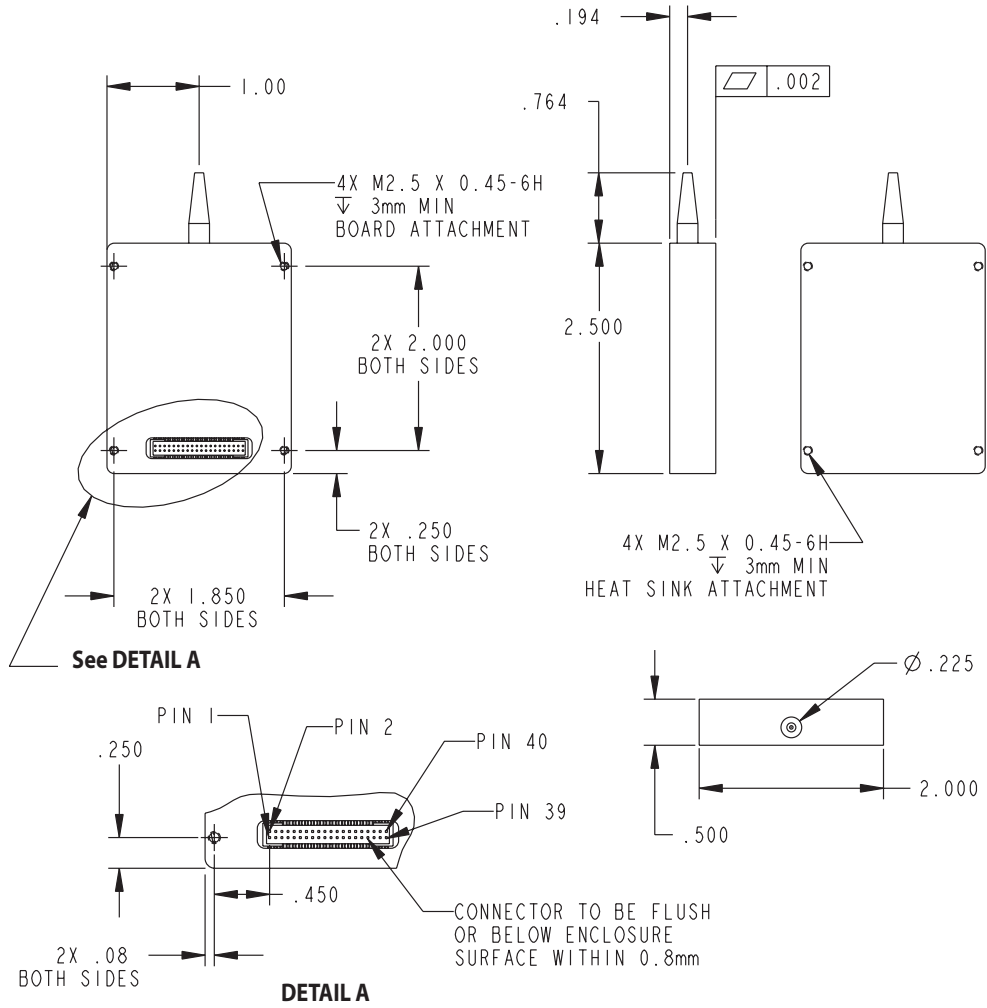
The integrated SOA acts as a shutter during wavelength switching and as an optional Variable Optical Attenuator (VOA) for pre-emphasis of transmitter power levels to optimize link performance.

The TLA also incorporates a digital controller and firmware. Polarization maintaining fiber pigtail is standard, with a ceramic ferrule termination. User control may be specified as I<sup>2</sup>C™, SPI, or UART.

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Dimensions Diagram

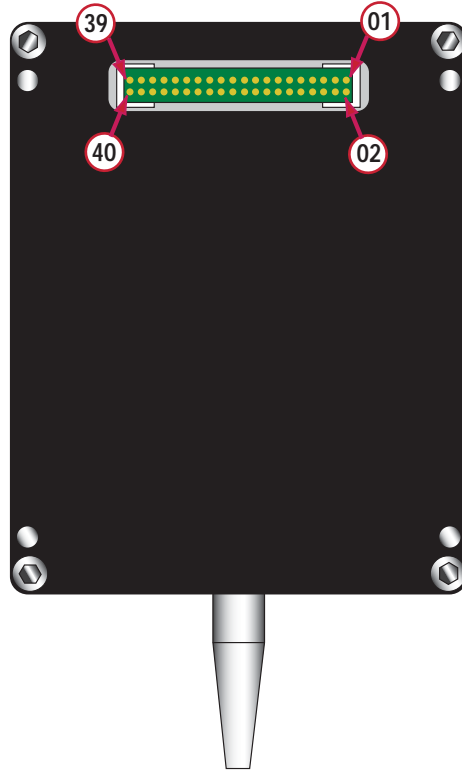
(Specifications in inches unless otherwise noted.)



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## Pinout

| Pin | Description   |
|-----|---|
| 1   | TEC Voltage   |
| 2   | TEC Voltage   |
| 3   | TEC Voltage   |
| 4   | TEC Voltage   |
| 5   | Ground  |
| 6   | Ground  |
| 7   | Ground  |
| 8   | Ground  |
| 9   | +3.3 V, Analog  |
| 10  | +3.3 V, Analog  |
| 11  | Ground  |
| 12  | Ground  |
| 13  | +3.3 V, Digital   |
| 14  | +3.3 V, Digital   |
| 15  | Ground  |
| 16  | Ground  |
| 17  | Reset, Active Low   |
| 18  | Communication Bus Select <sup>1</sup>                     |
| 19  | Laser Disable, Active Low                                 |
| 20  | Communication Bus Select <sup>2</sup>                     |
| 21  | Channel Tagging   |
| 22  | I <sup>2</sup> C™ NEC/SPI Output Data/UART Tx Data        |
| 23  | Reserved for Future Use—NEC <sup>3</sup>                  |
| 24  | I <sup>2</sup> C™ Serial Data/SPI Input Data/UART Rx Data |
| 25  | Reserved for Future Use—NEC                               |
| 26  | I <sup>2</sup> C™ Serial Clock/SPI Input Clock/UART NEC   |
| 27  | Reserved for Future Use—NEC                               |
| 28  | I <sup>2</sup> C™ NEC/SPI Slave Select/UART NEC           |
| 29  | Wavelength Lock Status, Active Low                        |
| 30  | I <sup>2</sup> C™ A0/SPI Slave Ready/UART NEC             |
| 31  | Service Alarm, Active Low                                 |
| 32  | I <sup>2</sup> C™ A1/SPI NEC/UART NEC                     |
| 33  | Urgent Alarm, Active Low                                  |
| 34  | I <sup>2</sup> C™ A2/SPI NEC/UART NEC                     |
| 35  | Manufacturing Services—NEC                                |
| 36  | Manufacturing Services—NEC                                |
| 37  | Manufacturing Services—NEC                                |
| 38  | Manufacturing Services—NEC                                |
| 39  | Manufacturing Services—NEC                                |
| 40  | Manufacturing Services—NEC                                |



1. Module Connector type: Samtec FTS-120-03-F-DV-S or equivalent (pin)

2. PCB Connector type: Samtec CLP-120-02-G-D-P or equivalent (socket)

3. NEC = No External Connection

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**Absolute Maximum Ratings**

| Parameter  | Symbol             | Minimum         | Maximum |
|--|--------------------|-----------------|---------|
| TEC supply voltage   | V <sub>CC</sub>    | 0 V             | 6 V     |
| 3.3 V supply voltage (analog)  | V <sub>DDana</sub> | 0 V             | 3.6 V   |
| 3.3 V supply voltage (digital)   | V <sub>DDdig</sub> | 0 V             | 3.6 V   |
| Operating case temperature range                                       | T <sub>op</sub>    | -5°C            | 70°C    |
| Storage case temperature range   | T <sub>stg</sub>   | -40°C           | 85°C    |
| Relative humidity (noncondensing)                                      | RH                 | -               | 85%     |
| Minimum fiber-bend radius  |                    | 1 in. (25.4 mm) | -       |
| Maximum LVTTTL input voltage<br>(Pins 17–20, 24, 26, 28, 30, 32, & 34) | V <sub>IL</sub>    | -               | 3.6 V   |

Note: Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operations sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

**Electrical Specifications**

| Parameter                                   | Symbol             | Minimum | Typical | Maximum |
|---|--------------------|---------|---------|---------|
| TEC supply voltage <sup>1</sup>             | V <sub>CC</sub>    | 3.13 V  | 5.0 V   | 5.25 V  |
| TEC supply current                          | I <sub>CC</sub>    | -       | 1000 mA | 2300 mA |
| 3.3 V supply voltage (analog) <sup>2</sup>  | V <sub>DDana</sub> | 3.13 V  | 3.3 V   | 3.47 V  |
| 3.3 V supply current (analog) <sup>3</sup>  | I <sub>DDana</sub> | -       | 550 mA  | 700 mA  |
| 3.3 V supply voltage (digital) <sup>2</sup> | V <sub>DDdig</sub> | 3.13 V  | 3.3 V   | 3.47 V  |
| 3.3 V supply current (digital) <sup>3</sup> | I <sub>DDdig</sub> | -       | 140 mA  | 200 mA  |
| Power dissipation <sup>4</sup>              | P <sub>DIS</sub>   | -       | 5.5 W   | 6.5 W   |

1. TEC supply voltage may be set to either 3.3 V or 5 V. Common 3.3 V supply may be used for analog, digital, and TEC.

2. 3.3 V analog and digital supplies can be linked.

3. Total current from 3.3 V supplies not to exceed 2300 mA.

4. Steady-state power dissipation over lifetime and case operating range of -5 to 70°C.

**Channel Switching Specifications**

| Parameter                              | Symbol              | Minimum | Typical | Maximum   |
|--|---------------------|---------|---------|-----------|
| Blanked output power <sup>1</sup>      | P <sub>BLANK</sub>  | -       | -       | -30 dBm   |
| Locked frequency accuracy              |                     | -       | -       | ± 2.5 GHz |
| Wavelength switching time <sup>2</sup> | T <sub>switch</sub> | -       | -       | 10 ms     |

1. Output power is less than -30 dBm at frequencies more than 10 GHz away from new channel.

2. Switching time is duration from receipt of command to locked operation at new channel.

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**Optical Specifications**

| Parameter   | Symbol      | Minimum     | Typical      | Maximum      |
|---|-------------|-------------|--------------|--------------|
| Output power <sup>1</sup>                               | P           |             |              |              |
| 3205 TLA  |             | -           | 13 dBm       | -            |
| 3206 TLA  |             | -           | 10 dBm       | -            |
| Power variation <sup>2</sup>                            | $\Delta P$  |             |              |              |
| Within a channel, Tc = 0 - 70°C                         |             | -           | -            | ± 0.5 dB     |
| Between channels, Tc = 25°C                             |             | -           | -            | ± 0.5 dB     |
| Number of consecutive channels                          |             |             |              |              |
| 3205 TLA  |             | -           | 90           | -            |
| 3206 TLA  |             | -           | 92           | -            |
| Channel spacing   |             | -           | 50 GHz       | -            |
| Tuning range  | $\lambda c$ |             |              |              |
| 3205 TLA  |             | 1528.384 nm | -            | 1563.863 nm  |
|   |             | 191.70 THz  | -            | 196.15 THz   |
| 3206 TLA  |             | 1570.42 nm  | -            | 1608.76 nm   |
|   |             | 186.35 THz  | -            | 190.90 THz   |
| Frequency accuracy over life & temperature <sup>3</sup> |             | -           | -            | ± 2.5 GHz    |
| Linewidth <sup>4</sup>                                  | LW          | -           | -            | 10 MHz       |
| Relative intensity noise <sup>5</sup>                   | RIN         |             |              |              |
| 3205 TLA  |             | -           | -140 dB/Hz   | -135 dB/Hz   |
| 3206 TLA  |             | -           | -138.5 dB/Hz | -133.5 dB/Hz |
| Side mode suppression ratio <sup>6</sup>                | SMSR        |             |              |              |
| 3205 TLA  |             | 40 dB       | 45 dB        | -            |
| 3206 TLA  |             | 38 dB       | 45 dB        | -            |
| SBS dither specifications                               |             |             |              |              |
| Peak-to-peak frequency modulation <sup>7</sup>          |             | 0.1 GHz     | -            | 1.2 GHz      |
| Residual amplitude modulation                           |             | -           | -            | 1%           |

1. Over lifetime and case temperature range of -5 to 70°C

2. Power variation within and between channels under locked operation, BOL.

3. Frequency accuracy under locked operation.

4. Effective 3 dB linewidth corresponding to phase noise density measured using coherent discriminator method.

5. Measured at worst case point between 0.1 - 10 GHz.

6. Ratio of average power in the dominant mode to that in the highest side mode (in a 0.1 nm resolution bandwidth).

7. Dither frequency is 12 kHz. Peak-to-peak modulation is adjustable in 0.1 GHz steps.

**Variable Optical Attenuator Specifications**

| Parameter         | Symbol           | Minimum | Typical | Maximum |
|-------------------|------------------|---------|---------|---------|
| Attenuation range | $\Delta P_{VOA}$ |         |         |         |
| 3205 TLA          |                  | 6 dB    | -       | -       |
| 3206 TLA          |                  | 4 dB    | -       | -       |

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## Tunable Laser Assembly (TLA) Installation

The TLA electrical connector pins will withstand mating forces similar to those of internal personal computer ribbon cables. Because the complete TLA is not hermetically sealed, do not immerse it or spray it with cleaning solutions or solvents. The fiber connector handling/protection (dust) cap and the fiber pigtail materials can deform at temperatures above +85°C.

## TLA Handling Considerations

Although the TLA has been designed to be physically robust, use care during handling and installation. Keep optical connector clean and free of surface particles. Keep the optical connector handling/protection cap in place when the fiber pigtail is not mated. Oil-free canned air or nitrogen with an extension tube may be used to help remove surface particles. Observe normal industry procedures for handling and cleaning. Use care in controlling the minimum fiber bend radius. Make sure that the protection cap is debris-free and clean prior to reinstalling it on the optical connector.

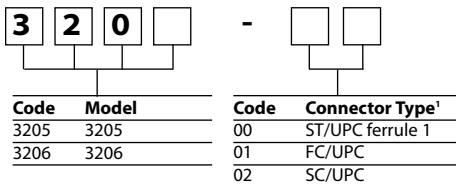
## Patents

This product is protected under U.S. Patent Number 4,896,325 and other patents pending worldwide.

## 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: 3205-00



1. Other connector styles and fiber lengths may be available by special order.

**Qualification and Reliability**

New product introduction follows a comprehensive gating structure that monitors time, costs, quality and reliability of the product from concept to volume manufacturing, and ensures that products meet all requirements during the life cycle.

The product qualification will fully meet the intent of the Telcordia standards, and qualifies the product in stages of integration, building upon qualified Core Technology Platforms. The laser components will be tested under accelerated life tests using both temperature and current, to determine the MTTF. Hermetic Laser Diode Modules will be qualified to GR-468-CORE.

**Laser Safety**

The 32XX versions of widely tunable lasers are classified as Class IM per IEC/EN 60825-1/A2:2001. This product complies with FDA/CDRH, 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50 dated 26 July, 2001.

Viewing the laser output with certain optical instruments (for example, eye loupes, magnifiers, and microscopes) within a distance of 100 mm may pose an eye hazard.

Laser power up to 40 mW at 1550 nm could be accessible if optical connector is open or fiber is broken.



**CAUTION: Class 1M Invisible laser radiation when open.** Do not view directly with optical instruments.

**Invisible Laser Radiation**

Do not view directly with optical instruments (magnifiers).  
Class 1M Laser Product per IEC/EN 60825-1/A2:2001  
40 mW at 1550 nm

**CAUTION:** Use of controls, adjustments, and procedures other than those specified herein may result in hazardous laser radiation exposure.

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