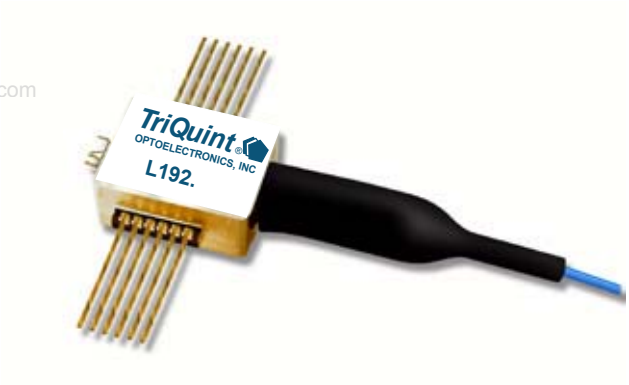
TriQuint OPTOELECTRONICS, INC.

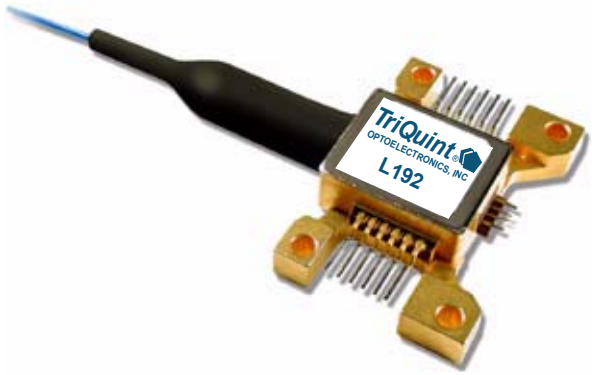
**Data Sheet**
**March 2003**

# L192-Type OC-192/STM-64 1310 nm Uncooled DFB Laser with Integrated Driver






**Featuring a 1310 nm DFB laser and integrated driver, the L192-type is manufactured in a compact, 16-pin butterfly package (above), and is also available with a convenient mounting bracket (below).**




## Features

- Data rates from 9.95 Gb/s to 10.7 Gb/s
- Integrated driver
- 1310 nm wavelength DFB laser
- No TEC required
- SDH STM-64 VSR600-2R1 and VSR2000-2R1 compliant
- Transmission distances up to 40 km
- Single-mode fiber pigtail with SC, FC, ST, or LC optical connector
- Operating case temperature range: 0 °C to 70 °C
- 50 Ω differential data input
- Package options:
  — Space-sensitive package without mounting bracket (ideal for transponder and transceiver applications)
  — With mounting bracket

## Applications

- Line terminal equipment
- SONET/SDH OC-192/STM-64 transponders and transceivers
- High-speed networks up to 10.7 Gb/s
- SONET/SDH OC-192/STM-64 telecommunications applications

## Description

### Laser Operation

The L192-type 10 Gb/s laser consists of a 1310 nm, isolated, MQW DFB laser and laser driver in a pig-tailed, butterfly, metal package. It is designed for use in single-mode, high-speed telecommunication applications at the SONET OC-192 and the ITU-T SDH STM-64 data rate of 9.95328 Gb/s.

At 10 Gb/s, the typical room temperature output power is –2 dBm with an extinction ratio of 7 dB. The operating case temperature range for the device is 0 °C to 70 °C.



The laser is manufactured in a compact, 16-pin butterfly package with a single-mode optical fiber pigtail. The fiber pigtail is internally beveled for low return loss and is available with SC, FC, ST, or LC optical connectors.

The DATA and $\overline{\text{DATA}}$ inputs must be ac coupled to prevent any dc offset from entering the device.

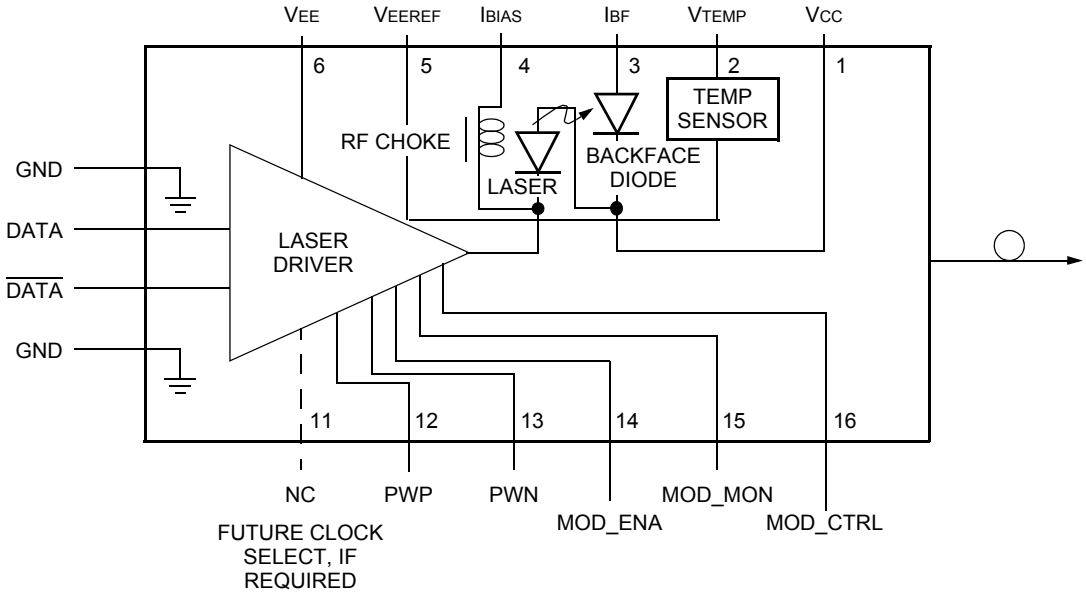
## Pin Information

**Table 1. Pin Descriptions**

| Pin Number | Name | I/O |
|---|---|---|
| 1 | $V_{CC}$ | I |
| 2 | Temperature Sensor | O |
| 3 | Back-facet Monitor Current | O |
| 4 | Laser Bias | I |
| 5 | $V_{EE}$ Reference | O |
| 6 | $V_{EE}$ | I |
| 7 | RF Ground | I |
| 8 | DATA | I |
| 9 | $\overline{\text{DATA}}$ | I |
| 10 | RF Ground | I |
| 11 | NUC[1] | I |
| 12 | Pulse Width P (PWP) | I |
| 13 | Pulse Width N (PWN) | I |
| 14 | Mod Enable | I |
| 15 | Mod Monitor | O |
| 16 | Mod Control | I |

1. No user connection. Future clock-select function.

## Block Diagram



## Absolute Maximum Ratings

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 section of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

| Parameter | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| Operating Case Temperature Range | $T_C$ | 0 | 70 | °C |
| Storage Temperature Range | $T_{stg}$ | –40 | 85 | °C |
| Supply Voltages[1]: | | | | |
| Positive Supply | $V_{CC}$ | — | 5.5 | V |
| Negative Supply | $V_{EE}$ | –5.5 | — | V |
| Laser Diode Reverse Voltage | — | — | 0 | V |
| Laser Diode Forward Current | — | — | 150 | mA |
| Optical Output Power | $P_{MAX}$ | — | 10 | mW |
| Monitor Diode Reverse Voltage | — | — | 20 | V |
| Monitor Diode Forward Current | — | — | 2 | mA |
| Data Input Voltage (ac)[2] | — | — | 1 | V |
| Modulation Current Control Voltage | — | — | 240 | mV |
| Pulse Width Inputs | PWP/PWN | $V_{EE}$ | $V_{EE}$ + 2 | V |
| Lead Soldering Temperature | — | — | 250 | °C |
| Lead Soldering Time | — | — | 10 | s |
| Relative Humidity | RH | — | 85 | % |
| Minimal Fiber Bend Radius | — | — | 1 | In. |

1. When $V_{EE}$ is connected to –5.2 V, $V_{CC}$ must be at 0 V; when $V_{CC}$ is connected to 5.0 V, $V_{EE}$ must be at 0 V.
2. Data Inputs must be ac coupled

## Optical and Electrical Characteristics

**Table 2. Optical and Electrical Characteristics** (Minimum and maximum values are over operating temperature range and end of life. Typical values are at room temperature and beginning of life unless otherwise specified.)

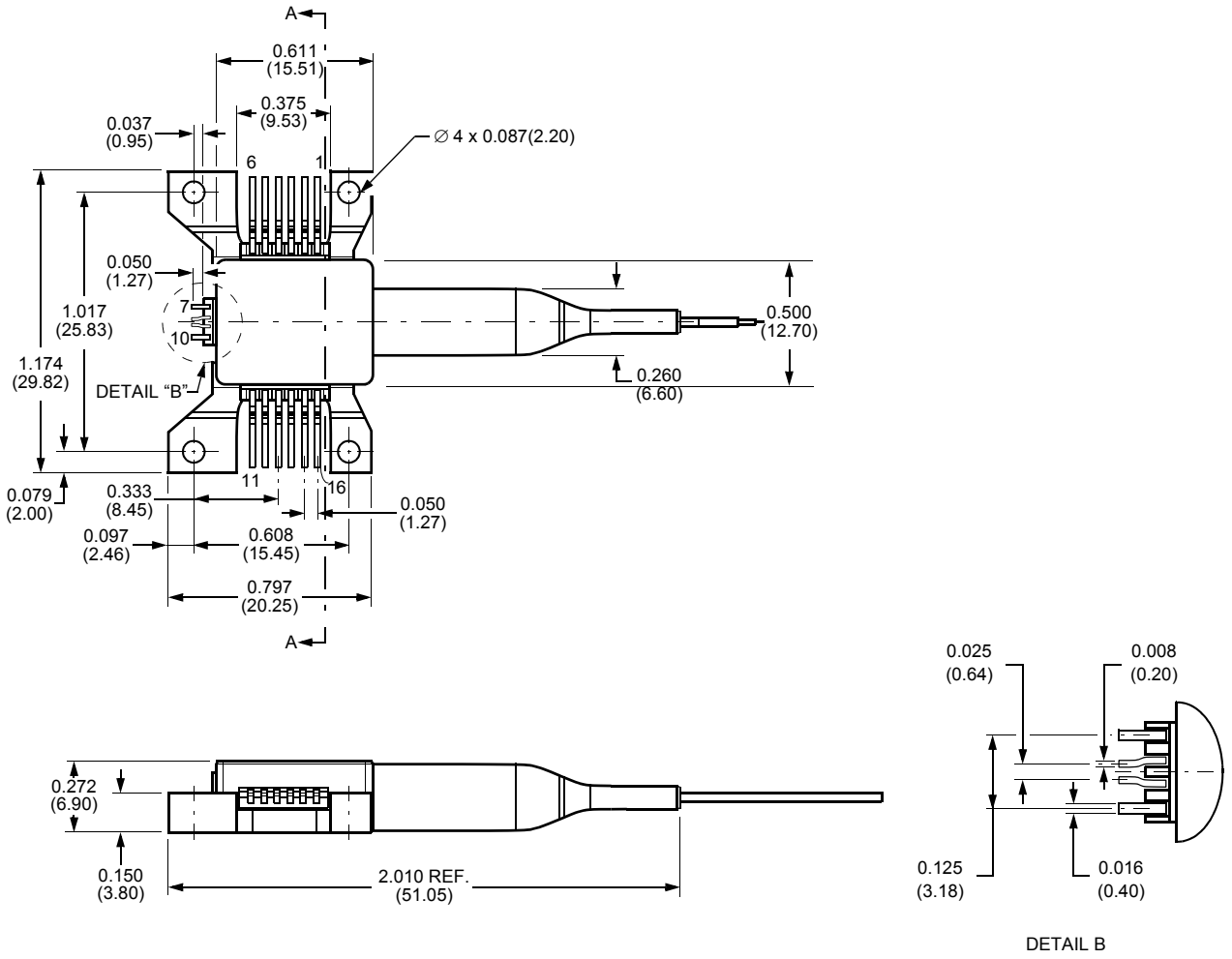
| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| dc Power Supply Voltages:<br>Negative Supply<br>Positive Supply | <br>$V_{EE}$<br>$V_{CC}$ | — | <br>–5.5<br>4.75 | <br>–5.2<br>5 | <br>–4.9<br>5.25 | <br>V<br>V |
| dc Power Supply Currents:<br>Negative Supply<br>Positive Supply | <br>$I_{EE}$<br>$I_{CC}$ | — | <br>130<br>130 | <br>180<br>180 | <br>260<br>260 | <br>mA<br>mA |
| Laser Threshold Current | $I_{TH}$ | 25 °C<br>0 °C to 70 °C | —<br>2 | 9<br>— | —<br>50 | mA<br>mA |
| Average Optical Output Power | $P_O$ | ER = 7.5 dB | –6 | –2 | –1 | dBm |
| Back-facet Monitor Current | $I_{BF}$ | $V_R$ = 5 V | 100 | — | 2000 | μA |
| Back-facet Monitor Dark Current | $I_D$ | $V_R$ = 5 V | — | 10 | 200 | nA |
| Back-facet Monitor Capacitance | $C_{BF}$ | $V_R$ = 5 V | — | — | 25 | pF |
| Tracking Error [1] | TE | — | — | — | ±1.25 | dB |
| Laser Modulation Voltage | $V_{MOD}$ | 25 °C, ER = 7.5 dB<br>0 °C to 70 °C, ER = 7.5 dB | 90<br>90 | 140<br>— | 180<br>230 | mV<br>mV |
| Laser Bias Current | $I_{BIAS}$ | 25 °C, ER = 7.5 dB<br>0 °C to 70 °C, ER = 7.5 dB | 13<br>6 | 25<br>— | 35<br>85 | mA<br>mA |
| Peak Wavelength | λ | — | 1290 | — | 1330 | nm |
| Wavelength Shift with Temperature | $\lambda_{\Delta T}$ | — | — | 0.09 | 0.1 | nm/°C |
| Side-mode Suppression Ratio | SMSR | — | 30 | — | — | dB |
| Spectral Width | $\lambda_{20}$ | 20 dB down from peak | — | — | 1 | nm |
| Extinction Ratio | ER | — | 6 | 7 | — | dB |
| Dispersion Penalty [2] | DP | 12 km max, G.652 | — | — | 1 | dB |
| Rise/Fall Time | $t_R/t_F$ | Unfiltered, 20%—80% | — | — | 50 | ps |
| Data Input Voltage:<br>Single-ended<br>Differential | $V_{IN}$ | — | <br>800<br>400 | <br>900<br>500 | <br>1000<br>1000 | <br>mV<br>mV |
| Data Input Impedance | $R_{IN}$ | — | — | 50 | — | Ω |
| Data Input Return Loss | $\lvert S_{11} \rvert$ | Up to 8 GHz<br>Up to 10 GHz | 10<br>6 | —<br>— | —<br>— | dB<br>dB |
| Optical Return Loss | $S_{22}$ | — | 30 | — | — | dB |
| Optical Isolation | $I_S$ | — | 20 | — | — | dB |
| Laser Temperature | $T_{LASER}$ | — | — | ($V_{TEMP}$[3] – 500 mV)/10 | — | °C |

1. $V_{TEMP}$ is the voltage measured on pin 2.
2. Can meet dispersion penalty at longer fiber links. Please contact TriQuint for additional information.
3. $V_{TEMP}$ is the voltage measured on pin 2.

# Outline Diagrams

### Outline Drawing, Package Style A

Dimensions are in inches and (millimeters).

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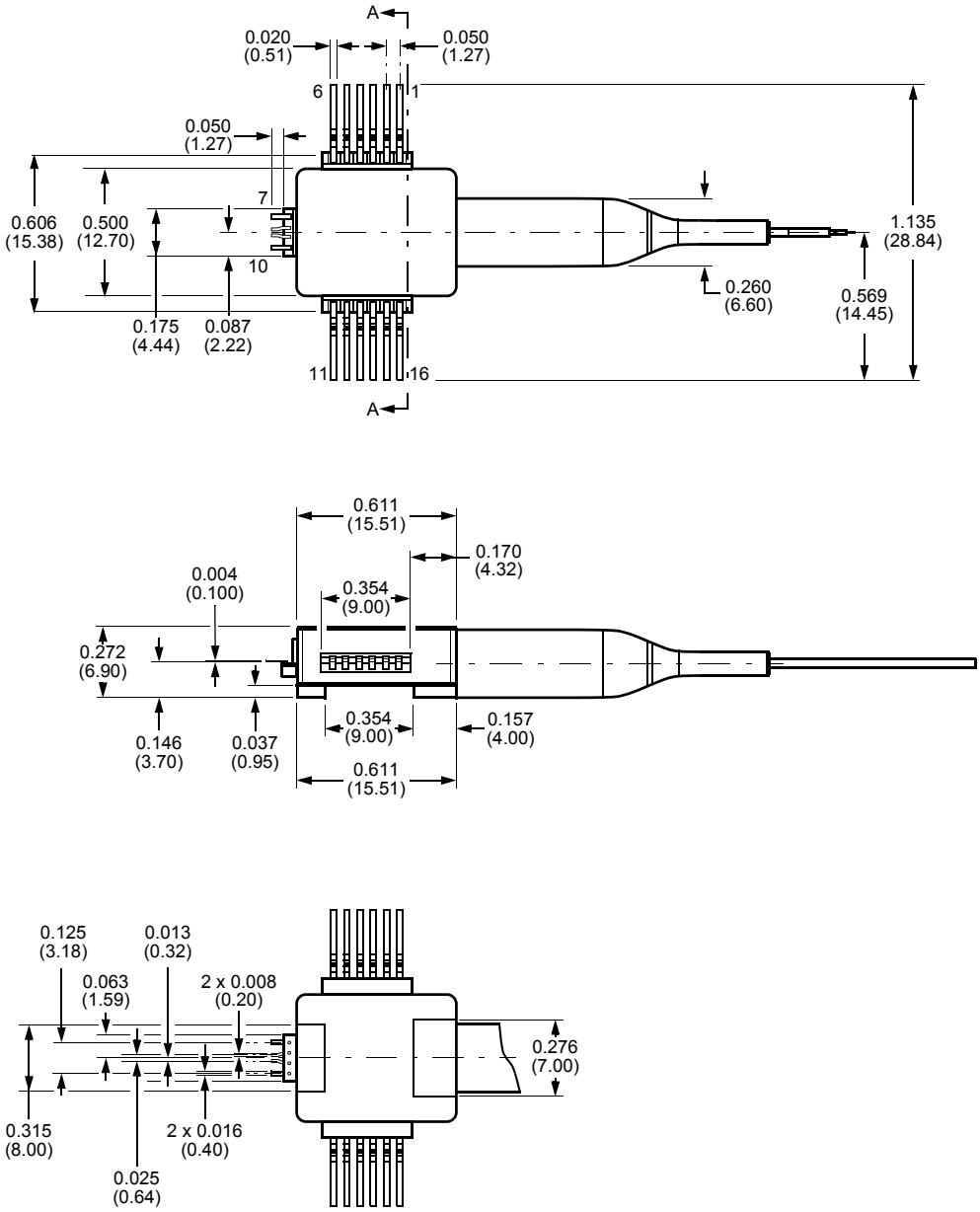
## Outline Diagrams (continued)

### Outline Drawing, Package Style N

Dimensions are in inches and (millimeters).



## Electrostatic Discharge

**CAUTION: This device is susceptible to damage as a result of electrostatic discharge. Take proper precautions during both handling and testing. Follow guidelines such as JEDEC Publication No. 108-A (Dec. 1988).**

TriQuint employs a human-body model (HBM) for ESD-susceptibility testing and protection-design evaluation. ESD voltage thresholds are dependent on the critical parameters used to define the model. A standard HBM (resistance = 1.5 kΩ, capacitance = 100 pF) is widely used and can be used for comparison purposes. The HBM ESD withstand voltage established for the L192 is 100 V.

## Laser Safety Information



### Class IIIb Laser Product

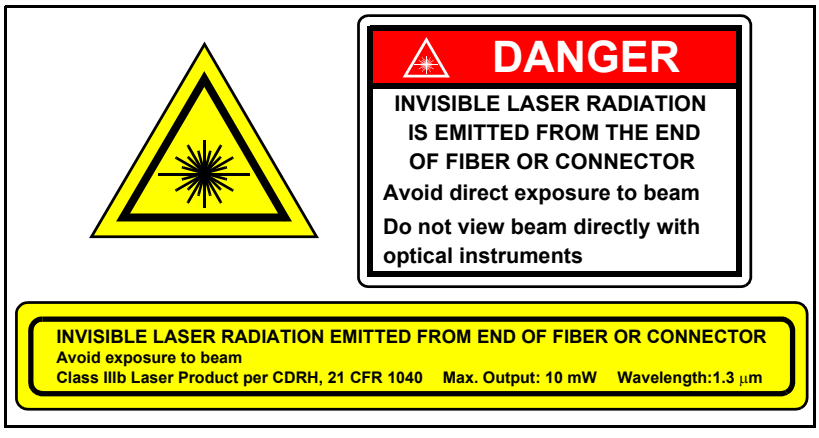
FDA/CDRH Class IIIb laser product. All versions are Class IIIb laser products per CDRH, 21 CFR 1040 Laser Safety requirements. All versions are classified Class 3B laser products consistent with *IEC*® 60825-1: 1993. This device family has been classified with the FDA under an accession number to be determined. Measurements were made to classify the product per *IEC* 60825-1: 1993.

This product complies with 21 CFR 1040.10 and 1040.11.
Single-mode fiber pigtail
Wavelength = 1310 nm
Maximum power = 10 mW

Because of size constraints, laser safety labeling (including an FDA Class IIIb label) is not affixed to the module but attached to the outside of the shipping carton.

Product is not shipped with power supply.

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



## Ordering Information

**Table 3. Ordering Information**

| Description | Product Code | Package Style | Connector | Comcode |
|---|---|---|---|---|
| L192-Type OC-192/STM-64 1310 nm Laser with Integrated Driver | L19210DN | N | SC | 700021068 |
| | L19210GN | N | FC | 700021069 |
| | L19210HN | N | ST | 700021070 |
| | L19210SN | N | LC | 700021071 |
| | L19210DA | A | SC | 700021064 |
| | L19210GA | A | FC | 700021065 |
| | L19210HA | A | ST | 700021066 |
| | L19210SA | A | LC | 700021067 |



*IEC* is a registered trademark of The International Electrotechnical Commission.

### *Additional Information*

For the latest specifications, additional product information, worldwide sales and distribution locations, and information about TriQuint:

**Web: www.triquint.com** **Tel: (503) 615-9000**

**E-mail: info_opto@tqs.com** **Fax: (503) 615-8902**

For technical questions and additional information on specific applications:

**E-mail: info_opto@tqs.com**