

TriQuint Optoelectronics

D572-Type 1.5 μm Uncooled DFB Laser Module for 2.5 Gb/s CWDM Applications



The low-profile D572-type laser module is ideally suited for OC-48 SONET and other high-speed digital applications

Features

- 8-pin package suitable for SONET/SDH applications
- Narrow linewidth, distributed feedback, multi-quantum-well (DFB-MQW) laser with single-mode fiber pigtail
- 1510 nm, 1530 nm, 1550 nm, and 1570 nm wavelength (1470 nm, 1490 nm, 1590 nm, and 1610 nm wavelength under development)
- Operating temperature range: 0 °C to +70 °C
- No TEC required
- High output power: typical 2.0 mW peak power coupled into single-mode fiber
- Hermetically sealed active components
- Internal back-facet monitor
- Built-in thermistor and bias T
- 25 Ω input impedance
- Internal isolator
- *Telcordia Technologies*™ TA-983 qualification program
- Bandwidth > 3 GHz

Applications

- SONET OC-48/SDH STM-16 systems
- Telecommunications
- Secure digital data systems

Benefits

- Easily board mounted
- Gull-wing leads
- No additional heat sinks required
- Low-cost alternative to industry-standard, 14-pin isolated laser module (ILM)
- Highly efficient DFB-MQW laser structure allows for lower threshold and drive currents, and reduced power consumption

Description

The D572-type uncooled laser module consists of a laser diode coupled to a single-mode fiber pigtail. The device is available in a standard, 8-pin configuration (see Figure 1 and/or Table 1) and is ideal for long-reach (SONET) and other high-speed digital applications.

The module includes a narrow linewidth (<1 nm) DFB-MQW single-mode laser and an InGaAs PIN photodiode back-facet monitor in a hermetically sealed package.

This package is optimized for a 25 Ω input impedance and allows for dc biasing through an internal bias tee. A thermistor has been included for feedback to board-level bias circuitry, if needed.

Description (continued)

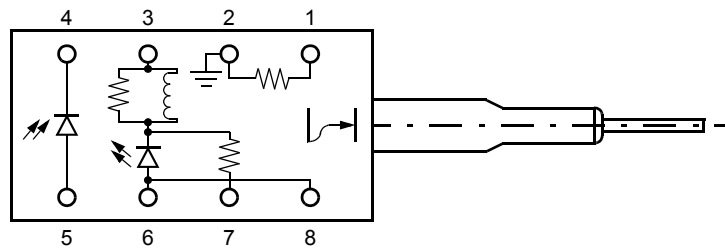
The device characteristics listed in this document are met at 2.0 mW output power. Higher- or lower-power operation is possible. Under conditions of a fixed photodiode current, the change in optical output is typically ± 0.5 dB over an operating temperature range of 0 °C to +70 °C.

This device incorporates the new Laser 2000 manufacturing process from the Optoelectronic Products unit of TriQuint Semiconductor. Laser 2000 is a low-cost platform that targets high-volume manufacturing and tighter product distributions on all optical subassemblies. This platform incorporates an advanced optical design that is produced on one of the highly automated production lines at the Optoelectronic manufacturing facility. The Laser 2000 platform is qualified for the central office and uncontrolled environments, and can be

used for applications requiring high performance and low cost.

Table 1. Pin Descriptions

Pin Number	Connection
1	Thermistor
2	Thermistor, package GND
3	Laser dc bias cathode (-) choke
4	Photodiode cathode
5	Photodiode anode
6	Laser diode anode (+)
7	Laser RF input cathode (-) 25 Ω
8	Laser diode anode (+)



1-900.b

Figure 1. D572-Type Uncooled DFB Mini 8-Pin Laser Module Schematic, Top View

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

Parameter	Symbol	Min	Max	Unit
Maximum Peak Laser Drive Current or Maximum Fiber Power*	I_{OP} P_{MAX}	—	150 10	mA mW
Peak Reverse Laser Voltage:				
Laser	V_{RL}	—	2	V
Monitor	V_{RM}	—	20	V
Monitor Forward Current	I_{FD}	—	2	mA
Operating Case Temperature Range	T_C	-40	85	°C
Storage Case Temperature Range	T_{stg}	-40	85	°C
Lead Soldering Temperature/Time	—	—	260/10	°C/s
Relative Humidity (noncondensing)	RH	—	85	%

* Rating varies with temperature.

Handling Precautions

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

TriQuint Semiconductor 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 k Ω , capacitance = 100 pF) is widely used and can be used for comparison purposes.

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 accession number 8720010. Measurements were made to classify the product per IEC 60825-1: 1993.

This product complies with 21 CFR 1040.10 and 1040.11.

8.3 μm single-mode pigtail or connector

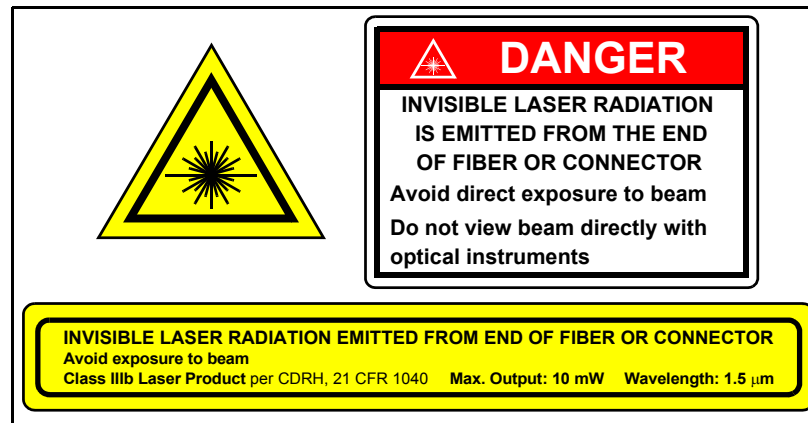
Wavelength = 1470 nm, 1490 nm, 1510 nm, 1530 nm, 1550 nm, 1570 nm, 1590 nm, or 1610 nm

Maximum power = 10 mW

Because of size constraints, laser safety labeling 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.



Electrical/Optical Characteristics

Table 2. Electrical/Optical Characteristics (over operating temperature range unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Operating Temperature Range	T	—	0	—	70	$^{\circ}\text{C}$
Optical Output Power	P_F	CW, peak	—	2	—	mW
Threshold Current	I_{TH}	T = 25 $^{\circ}\text{C}$ T = full range	5 2	11 —	15 60	mA mA
Modulation Current	I_{MOD}	CW, $P_F = 2.0$ mW, T = 25 $^{\circ}\text{C}$ CW, $I_{MON} = \text{constant}$, T = full range	15 7.5	25 —	35 60 ¹	mA mA
Slope Efficiency ²	SE	CW, $P_F = 2.0$ mW, T = 25 $^{\circ}\text{C}$	57	—	133	$\mu\text{W}/\text{mA}$
Center Wavelength	λ_C	CW, $P_F = 2.0$ mW, T = 25 $^{\circ}\text{C}$ 1470 nm codes 1490 nm codes 1510 nm codes 1530 nm codes 1550 nm codes 1570 nm codes 1590 nm codes 1610 nm codes	1467 1487 1507 1527 1547 1567 1587 1607	1470 1490 1510 1530 1550 1570 1590 1610	1473 1493 1513 1533 1553 1573 1593 1613	nm
Spectral Width (–20 dB)	$\Delta\lambda$	$P_F = 2.0$ mW	—	—	1	nm
Side-mode Suppression Ratio	SMSR	CW, $P_F = 2.0$ mW	30	40	—	dB
Tracking Error	TE	$I_{MON} = \text{constant}$, CW	—	—	1.5	dB
Spontaneous Emission	P_{TH}	$I = (0.9) I_{TH}$	—	—	100	μW
Rise/Fall Times	t_R, t_F	10%—90% pulse ³ , T = 25 $^{\circ}\text{C}$	—	0.125	0.175	ns
Optical Return Loss	ORL	CW	18	—	—	dB
Forward Voltage	V_F	At bias coil	—	1.0	1.6	V
Input Impedance	R	—	—	25	—	Ω
Monitor Current	I_{MON}	$V_R^4 = 5$ V	100	—	1000	μA
Monitor Dark Current	I_D	$V_R^4 = 5$ V	—	10	200	nA
Wavelength Temperature Coefficient	—	—	—	0.09	0.12	nm/ $^{\circ}\text{C}$

1. BOL value; EOL = 80 mA.

2. The slope efficiency is used to calculate the modulation current for a desired output power. This modulation current plus the threshold current comprise the total operating current for the device.

3. Corrected for electrical pulse fall time.

4. V_R = reverse voltage.

Qualification Information

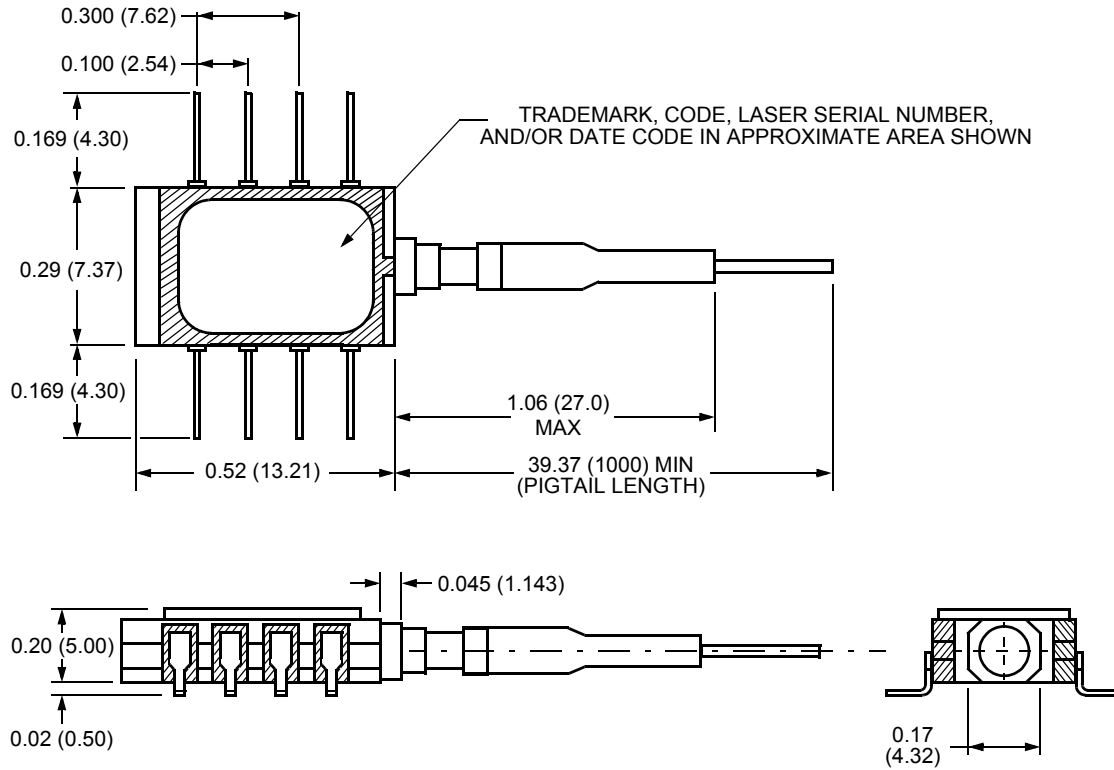
The D572-type laser module is scheduled to complete the following qualification tests and meets the intent of *Telcordia Technologies* TR-NWT-000468 for interoffice environments and TA-TSY-000983 for outside plant environments.

Table 3. D572-Type Laser Module Qualification Test Plan

Qualification Test	Conditions	Sample Size	Reference
Mechanical Shock	500 G	11	MIL-STD-883 Method 2002
Vibration	20 g, 20 Hz—2,000 Hz	11	MIL-STD-883 Method 2007
Solderability	—	11	MIL-STD-883 Method 2007
Thermal Shock	Delta T = 100 °C	11	MIL-STD-883 Method 2003
Fiber Pull	1 kg; 3 times	11	<i>Telcordia Technologies</i> 983
Accelerated (Biased) Aging	85 °C, 5,000 hrs.	25	<i>Telcordia Technologies</i> 983 Section 5.18
High-temperature Storage	85 °C, 2,000 hrs.	11	<i>Telcordia Technologies</i> 983
Temperature Cycling	500 cycles	11	<i>Telcordia Technologies</i> 983 Section 5.20
Cyclic Moisture Resistance	10 cycles	11	<i>Telcordia Technologies</i> 983 Section 5.23
Damp Heat	40 °C, 95% RH, 1344 hrs.	11	MIL-STD-202 Method 103
Internal Moisture	<5,000 ppm water vapor	11	MIL-STD-883 Method 1018
Flammability	—	—	TR357 Section 4.4.2.5
ESD Threshold	—	6	<i>Telcordia Technologies</i> 983 Section 5.22

Outline Diagram

Dimensions are in inches and (millimeters).



Ordering Information

Device Code*	Comcode	Pfiber	Center Wavelength	Connector†	Operating Case Temperature Range (°C)
D572A25AS	TBD	2.0 mW	1470 nm	SC-PC	0 to +70
D572A25FS	TBD	2.0 mW	1470 nm	FC-PC	0 to +70
D572A25SS	TBD	2.0 mW	1470 nm	LC-PC	0 to +70
D572B25AS	TBD	2.0 mW	1490 nm	SC-PC	0 to +70
D572B25FS	TBD	2.0 mW	1490 nm	FC-PC	0 to +70
D572B25SS	TBD	2.0 mW	1490 nm	LC-PC	0 to +70
D572C25AS	700039354	2.0 mW	1510 nm	SC-PC	0 to +70
D572C25FS	700039355	2.0 mW	1510 nm	FC-PC	0 to +70
D572C25SS	700039358	2.0 mW	1510 nm	LC-PC	0 to +70
D572D25AS	700039359	2.0 mW	1530 nm	SC-PC	0 to +70
D572D25FS	700039360	2.0 mW	1530 nm	FC-PC	0 to +70
D572D25SS	700039361	2.0 mW	1530 nm	LC-PC	0 to +70
D572E25AS	700039364	2.0 mW	1550 nm	SC-PC	0 to +70
D572E25FS	700039368	2.0 mW	1550 nm	FC-PC	0 to +70
D572E25SS	700039369	2.0 mW	1550 nm	LC-PC	0 to +70
D572F25AS	700039370	2.0 mW	1570 nm	SC-PC	0 to +70
D572F25FS	700039374	2.0 mW	1570 nm	FC-PC	0 to +70
D572F25SS	700039379	2.0 mW	1570 nm	LC-PC	0 to +70
D572G25AS	TBD	2.0 mW	1590 nm	SC-PC	0 to +70
D572G25FS	TBD	2.0 mW	1590 nm	FC-PC	0 to +70
D572G25SS	TBD	2.0 mW	1590 nm	LC-PC	0 to +70
D572H25AS	TBD	2.0 mW	1610 nm	SC-PC	0 to +70
D572H25FS	TBD	2.0 mW	1610 nm	FC-PC	0 to +70
D572H25SS	TBD	2.0 mW	1610 nm	LC-PC	0 to +70

* Trailing S in code indicates the module contains an isolator.

† Connectors will meet *Telcordia Technologies* GR-326-CORE.

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

Additional Information

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