

1997 Uncooled, Coaxial DFB Laser Diode

1270/1290/1310/1330/1350/1370/1530/1550 nm Wide Bandwidth 300 MHz – 6 GHz



Applications

- 5G Wireless
- Distributed Antenna Systems (DAS)
- Signal Distributions in L-Band and Wireless Remoting Links
- High Linearity, Low Power Fiber Links

Features

- Linear DFB Laser Design
- Output Power up to 10 dBm Available
- Bandwidth > 6 GHz
- RoHS Compliance
- Optical Isolator
- Low Power Consumption
- Monitor Photodiode

Ortel's Model 1997 uncooled, coaxial DFB laser offers a low-cost solution for next-generation, wireless linear fiber optic links. The 1997 laser module features extended bandwidth to 6 GHz and is optimized for 5G, DAS (Distributed Antenna Systems) and small cells applications. It is designed to enhance bandwidth and signal integrity for delivery of consistent, reliable wireless signals in temperature-controlled indoor environments.

These components can be cooled with external thermo-electric coolers for high-stability or run without TEC's to reduce power consumption. The DFB laser builds upon Ortel's long history of high-performance, leading-edge designs in wireless and high-speed digital applications. The laser diode devices are packaged in a compact hermetic assembly together with monitor photodiode and isolator, for flexible integration into various transmitter configurations.

Performance Highlights

| Parameters | | Min | Typical | Max | Units |
|--|--|-----|---------|------|-------|
| Operating Case Temperature Range | | -40 | - | 70 | °C |
| Optical Output Power ⁽¹⁾ | | - | 7 | - | mW |
| Frequency Range | | 300 | - | 6000 | MHz |
| IIP3 | F1=2660, F2=2670MHz, OMI 10%/tone ⁽²⁾ | 35 | - | - | dBm |
| | F1=3495, F2=3505MHz, OMI 10%/tone ^{(2) (3)} | 35 | | | |
| | F1=5790, F2=5800MHz, OMI 10%/tone ^{(2) (3)} | 30 | | | |
| IIP2 | F1=1700, F2=2100MHz, OMI 10%/tone ^{(2) (3)} | 45 | - | - | dBm |
| | F1=2100, F2=3800MHz, OMI 10%/tone ^{(2) (3)} | 40 | - | - | |
| Tolerance from Center Wavelength | | -4 | - | +4 | nm |
| Optical Return Loss ⁽¹⁾ | | 35 | - | - | dB |
| Side Mode Suppression Ratio, CW ⁽¹⁾ | | 35 | - | - | dB |

1. Performance at Tcase = 25°C
2. 2-tone tests. OMI 10%/tone, 0dBm input RF power, with eval board matched laser impedance to 50ohm.
3. Not production tested. Guarantee by design.

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DATASHEET | JANUARY 2024

WIRELESS

Absolute Maximum Ratings¹

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

| Parameters | Symbol | Condition/Notes | Min | Max | Unit |
|---------------------------------|--------------------|------------------|------|--------|--------|
| Storage Temperature | T _{STG} | Non-Operating | -40 | 85 | °C |
| Operating Case Temperature | T _{OP} | Continuous | -40 | 75 | °C |
| Laser Diode Forward Current | I _{OP} | CW | - | 100 | mA |
| Laser Diode Reverse Voltage | V _R | Continuous | - | 1.0 | V |
| Photodiode Forward Current | I _{MPD} | Continuous | - | 2 | mA |
| Photodiode Reverse Voltage | V _{MPD,R} | Continuous | - | 10 | V |
| Maximum RF Input Power | Pin_max | 60 Seconds | - | 25 | dBm |
| Lead Soldering Temperature/Time | - | - | - | 260/10 | °C/sec |
| Relative Humidity | RH | Continuous | - | 85 | % |
| ESD | - | Human Body Model | -500 | +500 | V |

1. Absolute maximum data are limited to system design only; proper device performance is not guaranteed over rating listed above. Operation beyond these maximum conditions may degrade device performance, lead to device failure, shorter lifetime, and will invalidate the device warranty.

Electrical/Optical Characteristics

| Parameters | Symbol | Conditions/Notes | Min | Typ | Max | Unit |
|--------------------------|------------------|--|------|------|------|-------|
| Optical Output Power | P _O | T _{case} = 25°C | - | 7 | - | mW |
| Threshold Current | I _{TH} | T _{case} = 25°C | - | 7 | 15 | mA |
| Laser Bias Current | I _{OP} | | - | | 80 | mA |
| Forward Voltage | V _F | I _{op} | - | 1.17 | 1.8 | V |
| Slope Efficiency | SE | T _{case} = 25°C, I _{op} | 0.1 | 0.16 | - | mW/mA |
| Thermal Slope Efficiency | TSE | SE(Tc)/SE(25°C) T _{case} = -20°C to 85°C | 0.4 | - | 1.2 | - |
| Laser Input Impedance | Z | - | 2 | 6 | 8 | Ω |
| MPD Current | I _{MPD} | V _{MPD} = 5V, I _{op} | 50 | - | 1000 | μA |
| MPD Dark Current | I _D | V _{MPD} = 5V, I _{op} = 0 T _{case} = 25°C | - | - | 50 | nA |
| Center Wavelength | λ _c | I _{op} | 1270 | - | 1550 | nm |
| Relative Intensity Noise | RIN | I _{op} , T _{case} = 25°C, 3500MHz | - | - | -150 | dB/Hz |

Electrical/Optical Characteristics (continued)

| Parameters | Symbol | Conditions/Notes | Min | Typ | Max | Unit |
|--|-----------------|---|------|-----|------|------|
| Tracking Error | ΔP_f | $I_{MON} = \text{const}$ $ER = 10\log(P_o/2.0)$ [dB] | -1.5 | - | +1.5 | dB |
| Optical Isolation, $T_{case} = 25^\circ\text{C}$ | ISO | Single Isolator | 25 | - | - | dB |
| Spectral Width (-20 dB) | $\Delta\lambda$ | I_{op} | - | 0.1 | 1.0 | nm |
| Side Mode Suppression Ratio | SMSR | I_{op} | 35 | 45 | - | dB |
| Optical Return Loss | ORL | $T_{case} = 25^\circ\text{C}$ | 35 | - | - | dB |

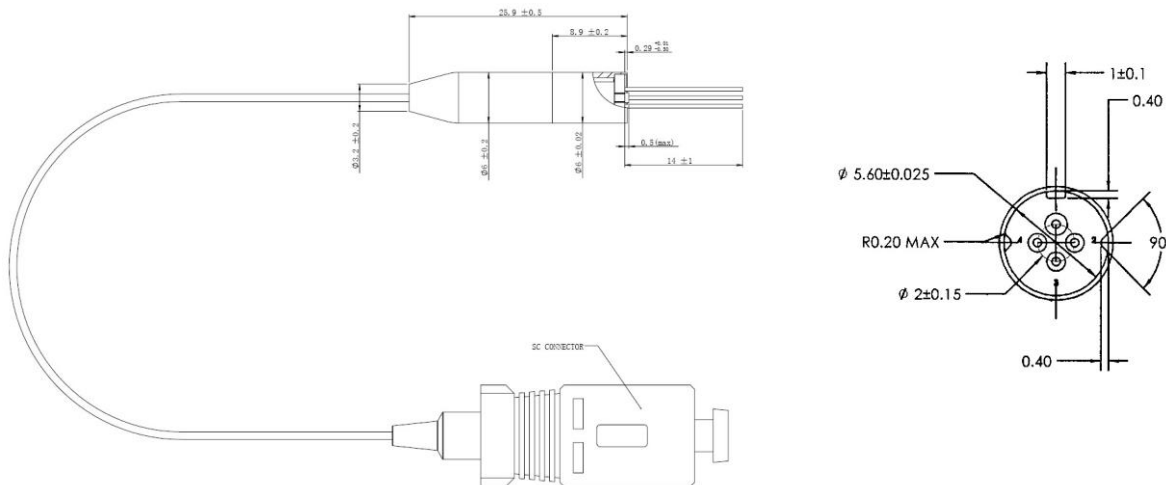
1. Referenced to base of TO header.

RF Characteristics

| 1997 Performance Parameter | Symbol | Conditions/Notes | Min | Typ | Max | Unit |
|--|------------|--|-----|-----|-----|-------------------|
| Frequency Response Flatness ¹ | $ S_{21} $ | 300 MHz - 6000 MHz | - | - | 4 | dB _{p-p} |
| Input Third Order Interception Point | IIP3 | F1=2660, F2=2670MHz, OMI 10%/tone ² | 35 | | | dBm |
| | | F1=3495, F2=3505MHz, OMI 10%/tone ^{2,4} | 35 | | | |
| | | F1=5790, F2=5800MHz, OMI 10%/tone ^{2,4} | 30 | | | |
| Input Second Order Interception Point | IIP2 | F1=1700, F2=2100MHz, OMI 10%/tone ^{2,4} | 45 | | | dBm |
| | | F1=2100, F2=3800MHz, OMI 10%/tone ^{2,4} | 40 | | | |

1. I_{op} , $T_{case} = 25^\circ\text{C}$. Test with the laser Input pin matched to a 50Ω system.
2. 10% OMI/tone, 0dBm input RF power, 0 km fiber.
3. PDI of optical receiver is 1.5mA with PD responsivity about 0.8A/W
4. Not production tested. Guarantee by design.

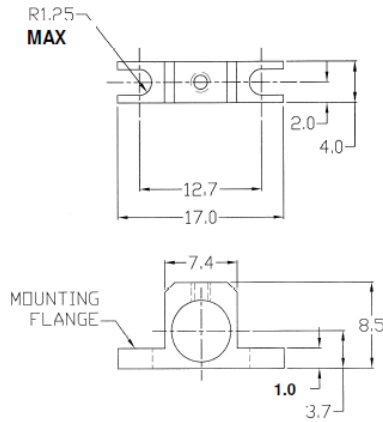
Package Outline Drawing (dimensions are in mm)



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Mounting Bracket



NOTES:

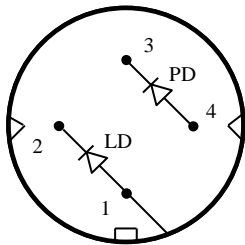
1. UNIT: mm
2. TOLERANCE: $\pm 0.1\text{mm}$ UNLESS OTHERWISE SPECIFIED

Reliability/Quality

Designed to meet qualification requirements of Telcordia™ (Bellcore) GR-468-CORE.

Schematic and Pinout

Schematic and Pinout A



Pinout A

Bottom

Pin Definitions for Pinout A

| Pin | Description |
|-----|-----------------------|
| 1 | LD Anode, Case Ground |
| 2 | LD Cathode |
| 3 | PD Cathode |
| 4 | PD Anode |

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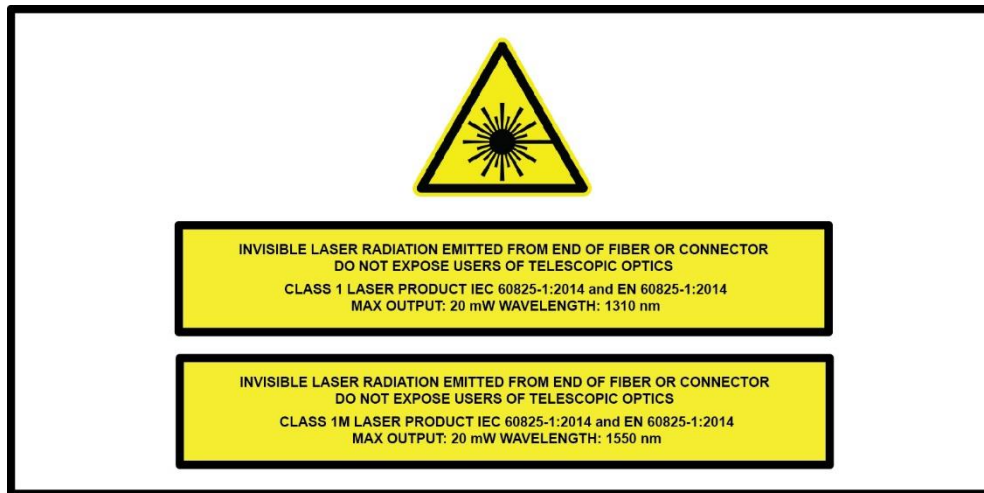
Laser Safety

This product meets the appropriate standard in Title 21 of the Code of Federal Regulations (CFR). This device has been classified with the FDA/CDRH under accession number 0220191.

The 1310nm version of this laser is Class 1 laser product, and the 1550nm version of this laser is Class 1M laser product, tested according to IEC 60825-1:2014/EN 60825-1:2014

Because of size constraints, laser safety labeling (including an FDA class 1/1M 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.

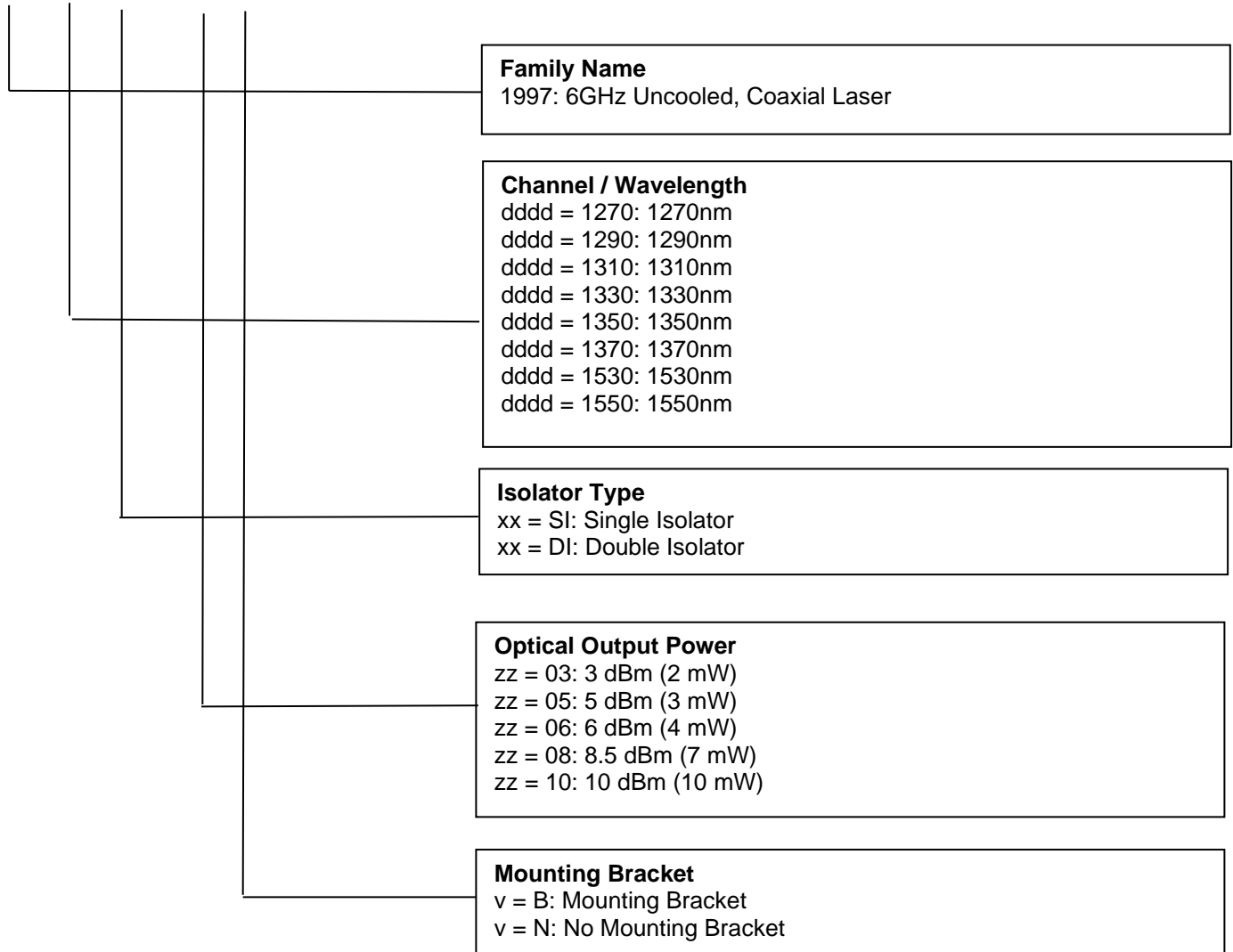


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Ordering Code Definitions

1997 - dddd - xx - SA - zz - v



Example

1997-1310-SI-SA-08-N: 6GHz Uncooled Coaxial Laser, 1310nm, single isolator, SC/APC optical connector, 7mW optical power, No Mounting Bracket