

Product Bulletin



2 mW WDM Laser for Direct Modulation in Links up to 100 km CQF915/108 Series

The JDS Uniphase CQF915/108 is a low power, directly modulated laser source in a butterfly package for metro wavelength division multiplexing (WDM) systems up to 100 km.

The laser is pigtailed with a single-mode fiber and shows excellent thermal stability (e.g., wavelength drift with case temperature much better than 1 pm/°C). The package features a high performance thermoelectric cooler for application in uncontrolled ambient temperatures. A cooled isolator minimizes dependence of the optical isolation on case temperature. The internal bias-T network and built-in monitor diode enable simple direct current bias conditioning and output power stabilization of the laser diode.

Under small signal modulation conditions, device bandwidth exceeds 3 GHz. Due to the distributed feedback (DFB) laser's intrinsic low chirp characteristic, the CQF915/108 is especially suitable for digital transmission at 1550 nm. Based on standard single-mode fiber with non-zero dispersion, the maximum dispersion penalty at BER = 10^{-10} is less than 1.5 dB for a total dispersion of up to 1800 ps/nm at 1550 nm. JDS Uniphase wavelength drift tests warrant long term wavelength stability.

Key Features

- 1550 nm (WDM) DFB laser diode
- 2.5 Gb/s suitable for OC-48 / STM-16
- Built-in high performance thermoelectric cooler
- Built-in cooled optical isolator
- Wavelengths available from 1528 - 1564 nm
- 25 Ω electrical impedance matching
- 100 km distance
(1800 ps/nm dispersion at 1550 nm)

Applications

- In WDM metro architectures and in cable television (CATV) networks where low optical output power is required. Especially suitable in environments with uncontrolled ambient temperature.

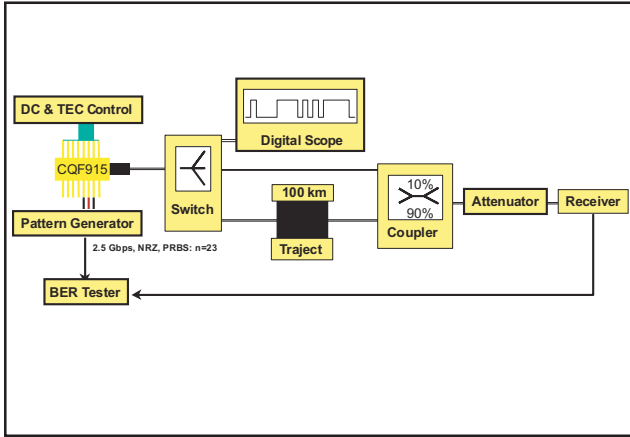
Specifications

| Limiting Values | | | | | | |
|---|---------------------|--|------|------|------|-------|
| Parameter | Symbol | Conditions | Min | Max | Unit | |
| Laser Diode | | | | | | |
| Radiant output power from pigtail | P_{peak} | See note ¹ | - | 15 | mW | |
| Reverse voltage | V_R | - | - | 2.0 | V | |
| Forward current | I_F | - | - | 200 | mA | |
| Monitor Diode | | | | | | |
| Reverse voltage | V_R | - | - | 20 | V | |
| Forward current | I_F | - | - | 10 | mA | |
| Module | | | | | | |
| Storage temperature range | T_{stg} | - | -40 | 85 | °C | |
| Operating temperature range | T_{op} | Cooler active | -20 | 85 | °C | |
| Fiber Pigtail | | | | | | |
| Bending radius | R | - | 35 | - | mm | |
| Tensile strength fiber to case | F | - | - | 5 | N | |
| Characteristics ($T_{chip} = T_{\lambda}$, T_{amb} at 25 °C, $P_{avg} = 0$ dBm unless otherwise specified) | | | | | | |
| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
| Radiant output power from pigtail | P_{peak} | See note ¹ | 2 | - | - | mW |
| Operating current | I_{op} | - | - | - | 85 | mA |
| Differential efficiency | η | - | 0.05 | - | 0.1 | mW/mA |
| Laser Diode | | | | | | |
| Threshold current | I_{th} | - | - | 20 | 35 | mA |
| Forward voltage | V_F | - | - | - | 2.0 | V |
| Central wavelength (ITU grid) | λ_c | - | 1528 | - | 1564 | nm |
| Laser set temperature for λ_c | T_{λ} | - | 20 | - | 35 | °C |
| Wavelength drift with case temperature | TE_{λ} | 20 °C < T_{λ} < 35 °C | - | - | 1 | pm/°C |
| Side mode suppression ratio | SMSR | - | 30 | 45 | - | dB |
| Dispersion penalty at BER = 10 ⁻¹⁰ | DP | NRZ, PRBS = 2 ²³ -1, 1800 ps/nm at 1550 nm with ER ≥ 10 dB | - | - | 1.5 | dB |
| Optical isolation | ISO | - | 30 | 35 | - | dB |
| RF Characteristics | | | | | | |
| Bandwidth (-3 dB) | S_{21} | - | 3 | - | - | GHz |
| Return loss | S_{11} | from 3 MHz to 2 GHz | - | - | -8 | dB |
| Return loss | S_{11} | from 2 GHz to 3 GHz | - | - | -5 | dB |
| Monitor Diode ($V_R = 10$ V) | | | | | | |
| Monitor diode responsivity | R | - | 25 | - | 1000 | μA/mW |
| Dark current | I_{md} | - | - | - | 0.1 | μA |
| Temperature tracking error | TE | 0 °C < T case < 85 °C | - | - | 15 | % |
| Thermistor | | | | | | |
| R_{th} | Resistance | $T_{th} = 25$ °C | 9.5 | 10 | 10.5 | kΩ |
| B | thermistor constant | | - | 3800 | 4100 | K |
| Thermoelectric Cooler | | | | | | |
| Cooler current, maximum | I_{cool} | at $\Delta T = 45$ °C | - | - | 1.0 | A |
| | | at $\Delta T = 65$ °C | - | - | 1.5 | A |
| Cooler voltage, maximum | V_{cool} | at $\Delta T = 45$ °C | - | - | 2.2 | V |
| | | at $\Delta T = 65$ °C | - | - | 3.2 | V |
| Reliability | | | | | | |
| Long term λ -drift, see note ² | ML | EOL: $\Delta\lambda = 0.2$ nm | 50 | 300 | - | yr |

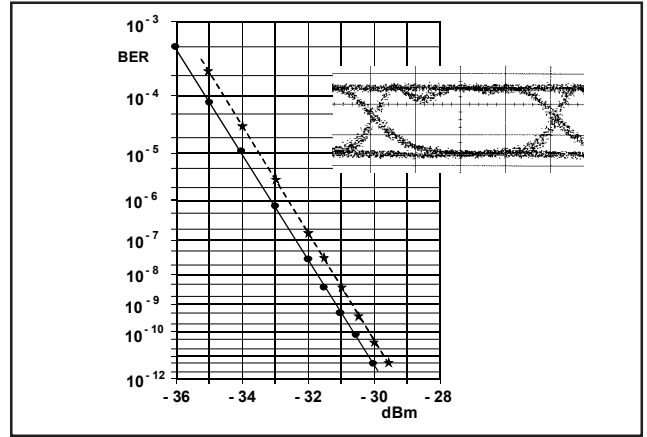
Notes

- Under modulation: $P_{avg} \approx P_{peak} / 2$ (mW) or $P_{avg} \approx P_{peak} - 3$ dBm (dBm).
- Mechanical integrity/environmental endurance tested according to Telcordia GR-468-CORE and MIL-STD-883
ML = Median Life, EOL = End Of Life.

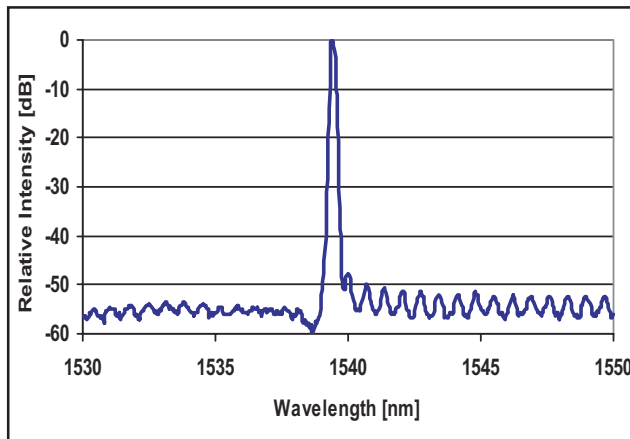
Typical Performance Characteristics



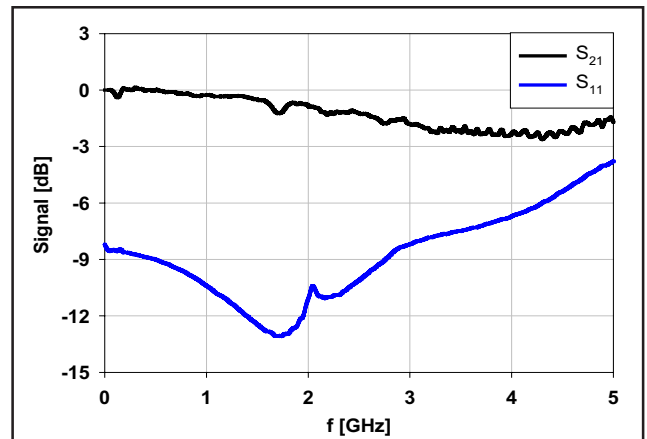
Each CQF915 laser is tested separately for dispersion penalty using a set-up with the required fiber length of 100 km (1800 ps/nm at 1550 nm).



Typical bit error rate measurement and eye diagram for CQF915 (2.5 Gb/s, NRZ, ER ≥ 10 dB, PRBS: n = 23, 1800 ps/nm at 1550 nm). Dispersion penalty is typically better than 1.0 dB at BER = 10⁻¹⁰.

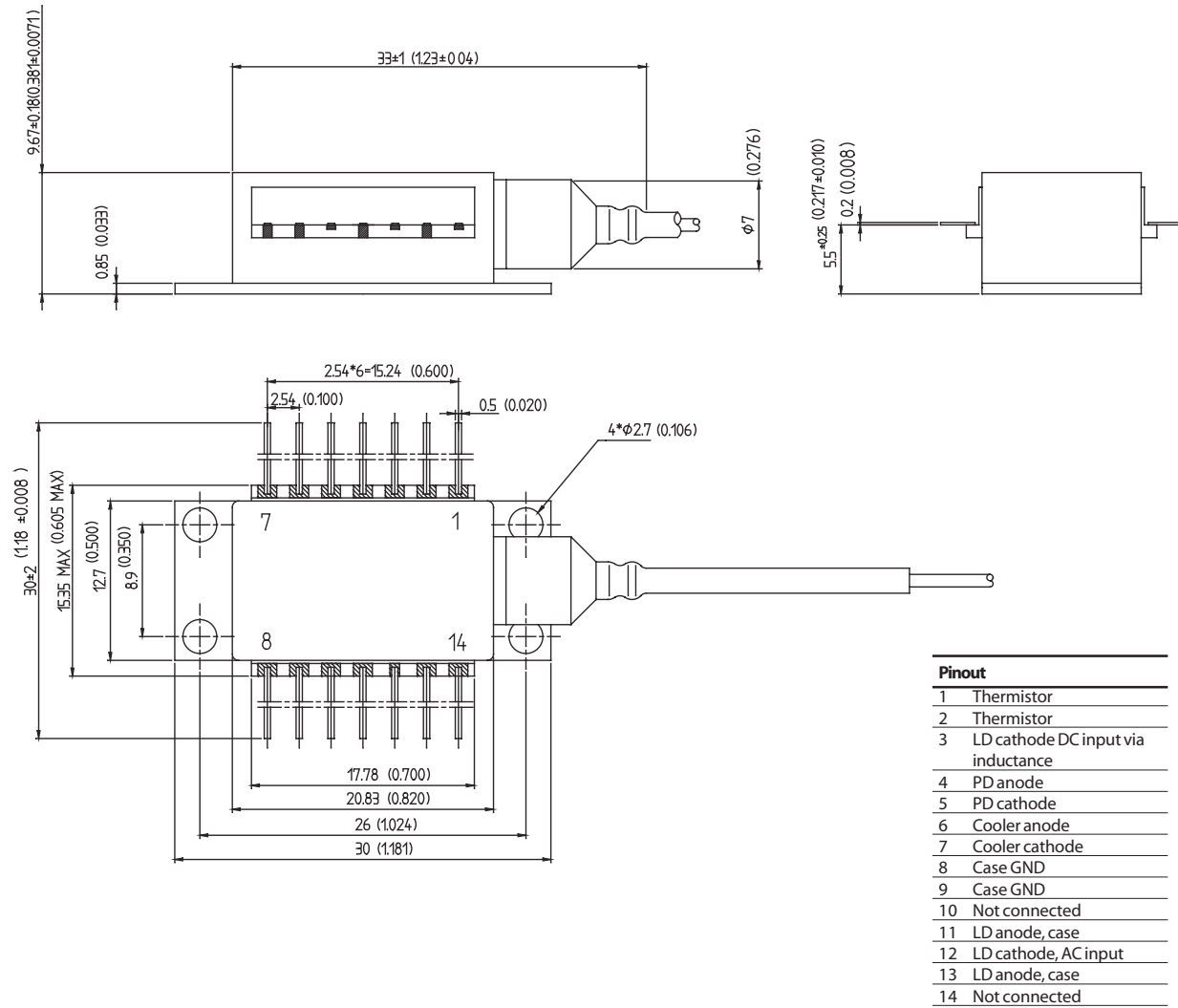


The optical spectrum measured at average output power for the CQF915.



Typical RF behavior measured at average output power for CQF915. S_{11} denotes the RF electrical reflection coefficient at the 25 Ω input measured with a 50 Ω test set. S_{21} is the small signal electrical-to-optical transfer coefficient.

Dimensions Diagram (Specifications in mm [inches] unless otherwise noted; tolerance = ± 0.15 [± 0.006])



Ordering Information

For more information on this or other products and their availability, please contact your local JDS Uniphase account manager or JDS Uniphase directly at 1-800-498-JDSU (5378) in North America and +800-5378-JDSU worldwide or via e-mail at sales@jdsu.com.

Sample: CQF915/108-19270 for wavelength 1555.75 nm.

Attention: Order confirmations on this part number will be preceded by FG' (e.g., FG'CQF915/108-19270).

CQF915/108- 

| Channel Code | Optical Frequency f_c (THz) | Wavelength (Vacuum) λ_c (nm) | Channel Code | Optical Frequency f_c (THz) | Wavelength (Vacuum) λ_c (nm) | Channel Code | Optical Frequency f_c (THz) | Wavelength (Vacuum) λ_c (nm) |
|--------------|-------------------------------|--------------------------------------|--------------|-------------------------------|--------------------------------------|--------------|-------------------------------|--------------------------------------|
| 19610 | 196.10 | 1528.77 | 19460 | 194.60 | 1540.56 | 19310 | 193.10 | 1552.52 |
| 19600 | 196.00 | 1529.55 | 19450 | 194.50 | 1541.35 | 19300 | 193.00 | 1553.33 |
| 19590 | 195.90 | 1530.33 | 19440 | 194.40 | 1542.14 | 19290 | 192.90 | 1554.13 |
| 19580 | 195.80 | 1531.12 | 19430 | 194.30 | 1542.94 | 19280 | 192.80 | 1554.94 |
| 19570 | 195.70 | 1531.90 | 19420 | 194.20 | 1543.73 | 19270 | 192.70 | 1555.75 |
| 19560 | 195.60 | 1532.68 | 19410 | 194.10 | 1544.53 | 19260 | 192.60 | 1556.56 |
| 19550 | 195.50 | 1533.47 | 19400 | 194.00 | 1545.32 | 19250 | 192.50 | 1557.36 |
| 19540 | 195.40 | 1534.25 | 19390 | 193.90 | 1546.12 | 19240 | 192.40 | 1558.17 |
| 19530 | 195.30 | 1535.04 | 19380 | 193.80 | 1546.92 | 19230 | 192.30 | 1558.98 |
| 19520 | 195.20 | 1535.82 | 19370 | 193.70 | 1547.72 | 19220 | 192.20 | 1559.79 |
| 19510 | 195.10 | 1536.61 | 19360 | 193.60 | 1548.51 | 19210 | 192.10 | 1560.61 |
| 19500 | 195.00 | 1537.40 | 19350 | 193.50 | 1549.32 | 19200 | 192.00 | 1561.42 |
| 19490 | 194.90 | 1538.19 | 19340 | 193.40 | 1550.12 | 19190 | 191.90 | 1562.23 |
| 19480 | 194.80 | 1538.98 | 19330 | 193.30 | 1550.92 | 19180 | 191.80 | 1563.05 |
| 19470 | 194.70 | 1539.77 | 19320 | 193.20 | 1551.72 | 19170 | 191.70 | 1563.86 |

Fiber Termination

- 1.25 mm or 2.5 mm ferrule.
- FC/PC, SC/PC, and SC/APC connectors optional

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North America toll-free: 1-800-498-JDSU (5378)
 Worldwide toll-free: +800-5378-JDSU
 www.jdsu.com

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