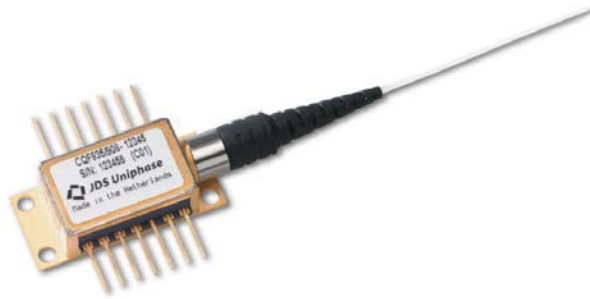


## Product Bulletin



### 63 mW 1550 nm CW DFB Lasers with PM Fiber for WDM Applications CQF935/908 Series

The JDS Uniphase CQF935/908 series laser is specifically developed for wavelength division multiplexing (WDM) systems, where it is used in combination with an external modulator, such as the LiNbO<sub>3</sub>-based Mach-Zehnder.

Selected wavelengths comply with ITU recommendations, both in range (1527.61 to 1610.06 nm) and in channel definition, thus adhering to the 100 GHz grid (0.8 nm) relative to a frequency of 193.1 THz (i.e., a wavelength of 1552.52 nm). It is possible to customize the wavelength spacing to a 50 GHz grid (0.4 nm).

Each laser's wavelength is accurately measured, and the laser itself is accompanied by a datasheet with the laser performance at the temperature  $T$ , where the required wavelength channel is reached.

The CQF935/908 shows high side mode suppression ratios, very low relative intensity noise, and small linewidths. It is available in a standard 14-pin butterfly package equipped with a polarization maintaining fiber to facilitate coupling to the modulator, and shows superb thermal stability.

#### Key Features

- 1550 nm WDM distributed feedback laser diode
- High power (>63 mW)
- Polarization maintaining fiber
- Built-in thermoelectric cooler
- Cooled, built-in optical isolator
- 1527 - 1610 nm wavelength range
- 0.8 nm (100 GHz) spacing
- 0.4 nm (50 GHz) spacing optional

#### Applications

- Hybrid fiber-coax (HFC) networks, cable-television (CATV) networks, and metro architectures where high power, low RIN, and narrow linewidths are required
- Long haul for compensation of high-loss passive or active components

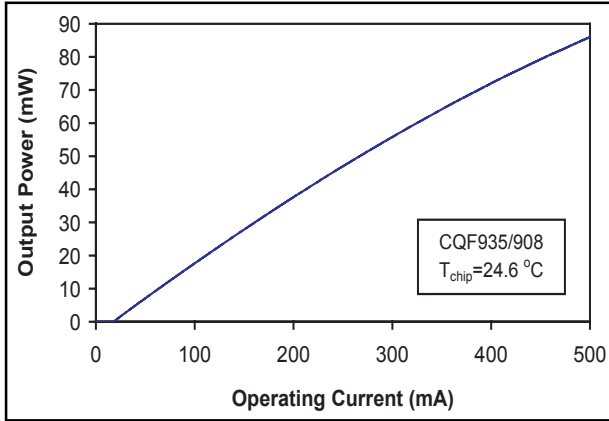
## Specifications

<b>Limiting Values</b>						
Parameter	Symbol	Conditions	Min	Max	Unit	
<b>Laser Diode</b>						
Radiant output power from pigtail	$P_{peak}$	-	-	100	mW	
Reverse voltage	$V_R$	-	-	2.0	V	
Forward current	$I_F$	-	-	600	mA	
<b>Monitor Diode</b>						
Reverse voltage	$V_R$	-	-	20	V	
Forward current	$I_F$	-	-	10	mA	
<b>Module</b>						
Storage temperature range	$T_{sig}$	(note <sup>1</sup> )	-40	85	°C	
Case operating temperature range	$T_{op}$	Cooler active	0	65	°C	
<b>Fiber Pigtail</b>						
Bending radius	R	-	35	-	mm	
Tensile strength fiber to case	F	(note <sup>1</sup> )	-	5	N	
<b>Characteristics</b> ( $T_{chip} = T_\lambda$ , $T_{amb} \equiv 25$ °C, $P_O = 63$ mW unless otherwise specified)						
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Radiant output power from pigtail	$P_O$	20 °C < $T_\lambda$ < 35 °C	63	-	-	mW
Operating current	$I_{op}$	-	-	320	500	mA
<b>Laser Diode</b>						
Threshold current	$I_{th}$	-	-	25	40	mA
Central wavelength (ITU grid)	$\lambda_c$	-	1527	-	1610	nm
Laser set temperature for $\lambda_c$	$T_\lambda$	-	20	-	35	°C
Forward voltage	$V_F$	-	-	-	2.5	V
Side mode suppression ratio	SMSR	-	30	45	-	dB
Optical isolation	ISO	-	30	35	-	dB
Relative intensity noise	RIN	20 - 1000 MHz	-	-	-160	dB/Hz
Spectral linewidth	$\Delta\lambda$	Full width, half maximum (FWHM)	-	-	1	MHz
Wavelength drift with case temp.	-	0 °C < $T_{case}$ < 65 °C	-	-	0.001	nm/°C
Wavelength temperature tunability	-	20 °C < $T_\lambda$ < 35 °C	0.07	-	0.12	nm/°C
<b>Monitor Diode</b> ( $V_R = 10$ V)						
Monitor diode responsivity	R	-	5	-	150	μA/mW
Dark current	$I_{md}$	-	-	-	0.1	μA
Temperature tracking error	TE	0 °C < $T_{case}$ < 65 °C	-	-	10	%
<b>Thermistor</b>						
Resistance	$R_{th}$	$T_{th} = 25$ °C	9.5	10	10.5	kΩ
Thermistor constant	B	-	3800	-	4100	K
<b>Thermoelectric Cooler</b> ( $\Delta T = 45$ °C)						
Cooler current	$I_{cool}$	-	-	-	1.6	A
Cooler voltage	$V_{cool}$	-	-	-	4.6	V
<b>Polarization Maintaining Fiber Pigtail</b> (Fujikura SM.15-P-8/125-UV/UV 400 PANDA or equivalent)						
Mode field diameter	$\varnothing_{mf}$	-	9.5	-	11.5	μm
Cladding diameter	$\varnothing_{cl}$	-	122	-	128	μm
Diameter of secondary coating	$\varnothing_{sc}$	-	380	-	420	μm
Diameter of loose tube	$\varnothing_{LT}$	-	0.8	-	1.0	mm
Length of loose tube	$l_{LT}$	-	0.9	-	-	m
Polarization extinction ratio	ER	E-field along slow axis	18	20	-	dB
Length of pigtail	-	-	1	-	-	m
<b>Reliability</b>						
Long term wavelength drift (note <sup>1</sup> )	$ML_\lambda$	EOL: $\Delta\lambda = 0.2$ nm	-	300	-	years

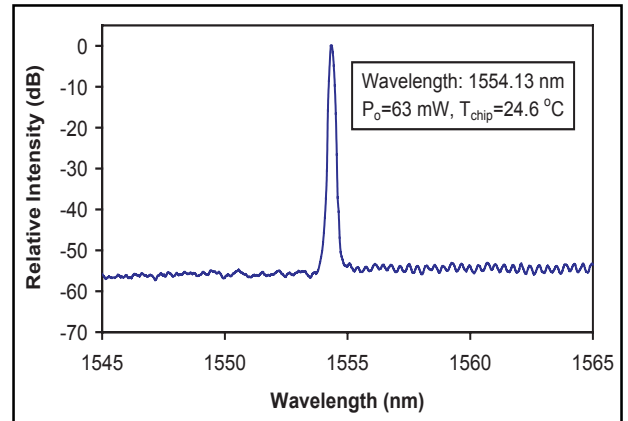
1. Mechanical integrity/environmental endurance tested according to Telcordia GR-468-CORE and MIL-STD-883

ML = Median Life, EOL = End Of Life.

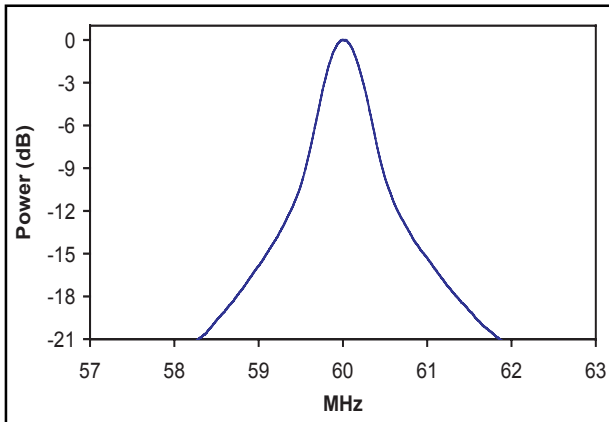
Typical Performance Characteristics



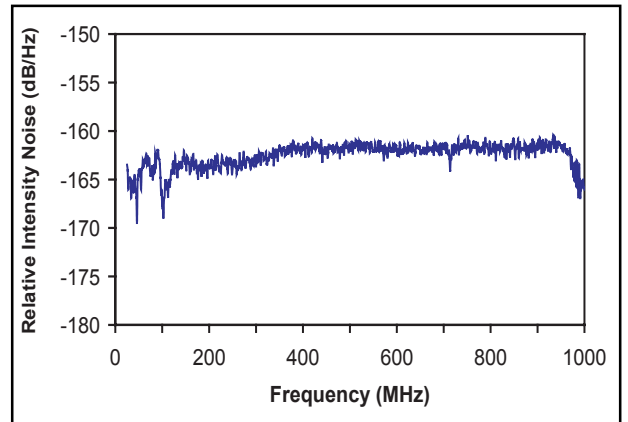
Typical L-I curve for the CQF935. Each laser is characterized at the temperature for which the specified wavelength channel  $\lambda_c$  is reached.



The use of multi-quantum well technology results in excellent side-mode suppression ratios and small linewidths. The inset shows how the wavelength is specified on each datasheet.

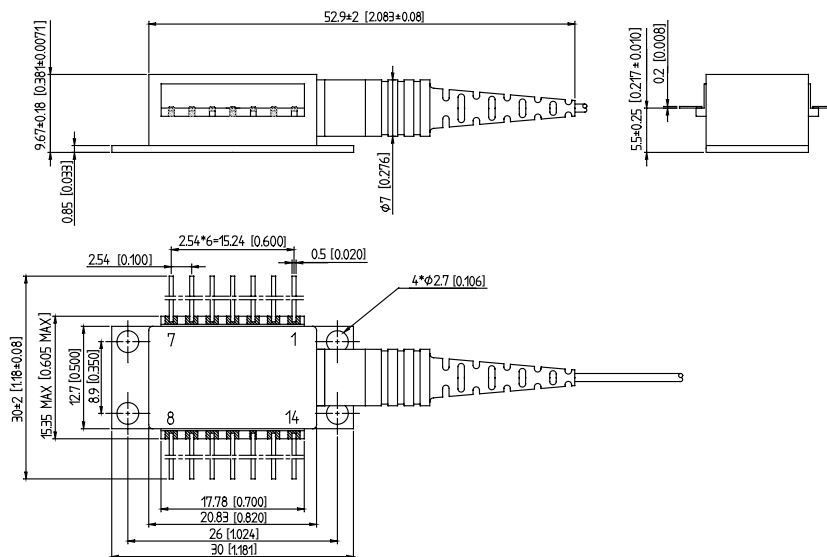


Linewidth at -3 dB is better than 1 MHz.



Relative intensity noise is better than -160 dB/Hz.

**Dimensions Diagram** (Specifications in mm [inches] unless otherwise noted; tolerance =  $\pm 0.15$  [ $\pm 0.006$ ]; coverpipe may change.)



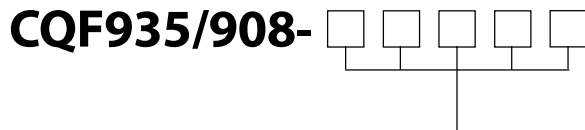
Pinout	
1	Thermistor
2	Thermistor
3	LD cathode DC input via inductance
4	PD anode
5	PD cathode
6	Cooler anode
7	Cooler cathode
8	Case GND
9	Case GND
10	Not connected
11	LD anode, case
12	LD cathode, AC input
13	LD anode, case
14	Not connected

**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: CQF935/908-19270 for wavelength 1555.75 nm.**

**Attention:** Order confirmations on this part number are preceded by FG' (e.g., FG'CQF935/908-19270).



Channel Code	Optical Frequency $f_c$ (THz)	Wavelength $\lambda_c$ (nm)	Channel Code	Optical Frequency $f_c$ (THz)	Wavelength $\lambda_c$ (nm)	Channel Code	Optical Frequency $f_c$ (THz)	Wavelength $\lambda_c$ (nm)
19630	196.30	1527.22	19290	192.90	1554.13	18950	189.50	1582.02
19620	196.20	1527.99	19280	192.80	1554.94	18940	189.40	1582.85
19610	196.10	1528.77	19270	192.70	1555.75	18930	189.30	1583.69
19600	196.00	1529.55	19260	192.60	1556.56	18920	189.20	1584.53
19590	195.90	1530.33	19250	192.50	1557.36	18910	189.10	1585.36
19580	195.80	1531.12	19240	192.40	1558.17	18900	189.00	1586.20
19570	195.70	1531.90	19230	192.30	1558.98	18890	188.90	1587.04
19560	195.60	1532.68	19220	192.20	1559.79	18880	188.80	1587.88
19550	195.50	1533.47	19210	192.10	1560.61	18870	188.70	1588.73
19540	195.40	1534.25	19200	192.00	1561.42	18860	188.60	1589.57
19530	195.30	1535.04	19190	191.90	1562.23	18850	188.50	1590.41
19520	195.20	1535.82	19180	191.80	1563.05	18840	188.40	1591.26
19510	195.10	1536.61	19170	191.70	1563.86	18830	188.30	1592.10
19500	195.00	1537.40	19160	191.60	1564.68	18820	188.20	1592.95
19490	194.90	1538.19	19150	191.50	1565.50	18810	188.10	1593.79
19480	194.80	1538.98	19140	191.40	1566.31	18800	188.00	1594.64
19470	194.70	1539.77	19130	191.30	1567.13	18790	187.90	1595.49
19460	194.60	1540.56	19120	191.20	1567.95	18780	187.80	1596.34
19450	194.50	1541.35	19110	191.10	1568.77	18770	187.70	1597.19
19440	194.40	1542.14	19100	191.00	1569.59	18760	187.60	1598.04
19430	194.30	1542.94	19090	190.90	1570.42	18750	187.50	1598.89
19420	194.20	1543.73	19080	190.80	1571.24	18740	187.40	1599.75
19410	194.10	1544.53	19070	190.70	1572.06	18730	187.30	1600.60
19400	194.00	1545.32	19060	190.60	1572.89	18720	187.20	1601.46
19390	193.90	1546.12	19050	190.50	1573.71	18710	187.10	1602.31
19380	193.80	1546.92	19040	190.40	1574.54	18700	187.00	1603.17
19370	193.70	1547.72	19030	190.30	1575.37	18690	186.90	1604.03
19360	193.60	1548.51	19020	190.20	1576.20	18680	186.80	1604.88
19350	193.50	1549.32	19010	190.10	1577.03	18670	186.70	1605.74
19340	193.40	1550.12	19000	190.00	1577.86	18660	186.60	1606.61
19330	193.30	1550.92	18990	189.90	1578.69	18650	186.50	1607.47
19320	193.20	1551.72	18980	189.80	1579.52	18640	186.40	1608.33
19310	193.10	1552.52	18970	189.70	1580.35	18630	186.30	1609.19
19300	193.00	1553.33	18960	189.60	1581.18	18620	186.20	1610.06

**Fiber Termination:** Default 1.25 mm ferrule



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