

RIO PLANEX™ Series 1550nm Low Phase Noise Narrow Linewidth External Cavity Laser

Key features

- Single longitudinal mode
- Center wavelength: 1530nm-1565nm,
ITU-T DWDM 100 GHz C-band or custom
- Very narrow linewidth, long coherence length
- Very low phase noise
- Wavelength tunability
- Ultra low RIN
- Excellent SMSR
- Excellent wavelength stability over life and
temperature
- Low sensitivity to vibration and acoustic noise
- CW, modulated and pulsed operations
- Small form factor, 14 pin butterfly
- Low power dissipation
- SM and PM fiber pigtail options
- Telcordia GR-468 qualified
- RoHS compliant

Applications

- Acoustic & seismic interferometric fiber
optic sensing
- Defense and security
- Oil & Gas – exploration and production
- LIDAR
- Metrology
- RF and microwave photonics
- Coherent Communications

Data Sheet
July 2021



Description

The RIO019x Series devices are high-performance, cost effective External Cavity Laser (ECL). The design is based on RIO's proprietary planar technology (**PLANEX™**) and consists of a gain chip and a planar lightwave circuit including waveguides with Bragg gratings, forming a laser cavity with significant advantages.

PLANEX™ laser combines high performance, comparable with long cavity fiber lasers, with the low cost, simplicity, small size and reliability of semiconductor lasers.

PLANEX™ laser is an ideal source for multiple commercial and military fiber optic sensors applications, including interferometric and Brillouin DTSS systems for oil & gas, security and smart infrastructure monitoring, coherent Doppler LIDAR for wind measurements, coherent and heterodyne metrology, photonic velocimetry and vibrometry, and coherent communications. Lasers are available with various wavelength, phase noise and output power options.

Absolute Maximum Ratings

Operation of the device beyond these maximum conditions may degrade device performance, lead to device failure, shorten product lifetime, and invalidates the device warranty.

Parameter	Min	Max	Unit
Storage temperature	- 40	+ 85	°C
Laser diode reverse voltage		1.2	V
Laser diode forward current		250	mA
Monitor diode reverse voltage		15	V
Monitor diode forward current		25	mA
TEC current		1.5	A
TEC voltage		4.0	V
ESD-susceptibility		500	V
Fiber bend radius	35		mm
Tensile strength, fiber to the package		5	N

Optical and Electrical Specifications

At recommended TEC set temperature T_s and bias current I_b

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
TEC set Temperature	T _{set}	Specified for every laser	15		50	°C
Output Power ¹	P _{out}	CW	see ordering information page			mW
Threshold current	I _{th}	@ T _{set}		10	15	mA
Laser Bias Current	I _b	CW, P _{out}		120	200	mA
Laser Forward Voltage	V _f	CW, @ 100mA		1.6	2	V
Center Wavelength (ITU grid)	λ	± 40 pm standard ²	1530		1565	nm
Side Mode Suppression Ratio	SMSR	CW, at specified P _{out}	40			dB
Wavelength vs. TEC Temperature	dλ/dT	T _{set} ± 2°C		12		pm/°C
Wavelength tunability ³	Δλ _T	via TEC temperature change	30 ⁴			pm
Relative Intensity Noise	RIN	≥ 1kHz			-140	dB/Hz
		≥ 500 kHz	Shot noise limited			
Polarization Extinction Ratio ⁵	PER	For PM option, polarization and connector key aligned to slow axis	20			dB
Monitor bias voltage	V _R	Cathode positive to anode	4.75	5	5.25	V
Monitor diode current	I _{mc}	P _{out}	0.05		1	mA
Monitor diode dark current	I _{md}	V _R = 5V			5	nA
Modulation bandwidth			1			GHz
Input Impedance	Z ₀			25		Ohm
Optical Isolation	ISO		40			dB

1. Please refer to ordering information page for output power specification
2. Customized wavelength, including ITU-T C-band and wavelength setting tolerance are available. See ordering information.
3. Phase continuous wavelength tuning by changing TEC temperature. Some performance parameters will change over tuning range. Contact RIO for additional information.
4. Tuning range is not symmetric around center wavelength, 30pm range is +10pm to -20pm as a minimum
5. With PM-fiber PANDA option. See ordering information page

Linewidth and Phase Noise Specifications

At recommended TEC set temperature T_s and bias current I_b ,

Parameter	Symbol	Conditions	Grade 1	Grade 3	Grade 4	Unit
Spectral Linewidth, FWHM ¹	$\Delta\lambda_L$		≤ 15	≤ 5	≤ 2	kHz
Phase Noise Typical Values ²	PhN	@ 10 Hz	123	41	20	$\mu\text{rad}/\text{rt-Hz}$ 1 m OPD
		@ 200 Hz	22	8	4	

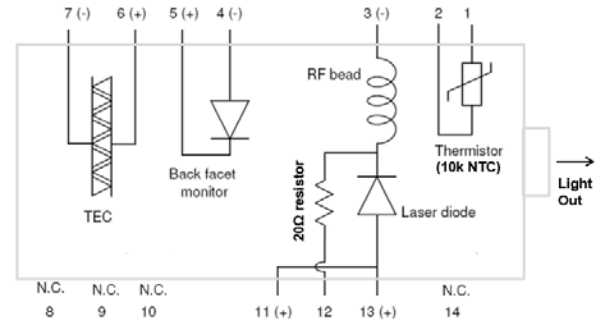
1. Values based on Lorentzian linewidth model.
2. As measured with RIO's interferometric phase noise test setup, 1m path mismatch in the SM fiber.

Thermal Specifications

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Operating temperature range (case)	T_c		-5		+ 75	°C
TEC current	I_{TEC}	$T_{CASE} = 75^{\circ}\text{C}$, T_s			1.1	A
TEC voltage	V_{TEC}	$T_{CASE} = 75^{\circ}\text{C}$, T_s			3.4	V
Thermistor resistance	R_t	At 25 °C		10		k Ω
Constant of thermistor	β			3950		K
TEC power dissipation	W_0	$T_{CASE} = -5$ to 75°C , T_s		2.0	3.5	W

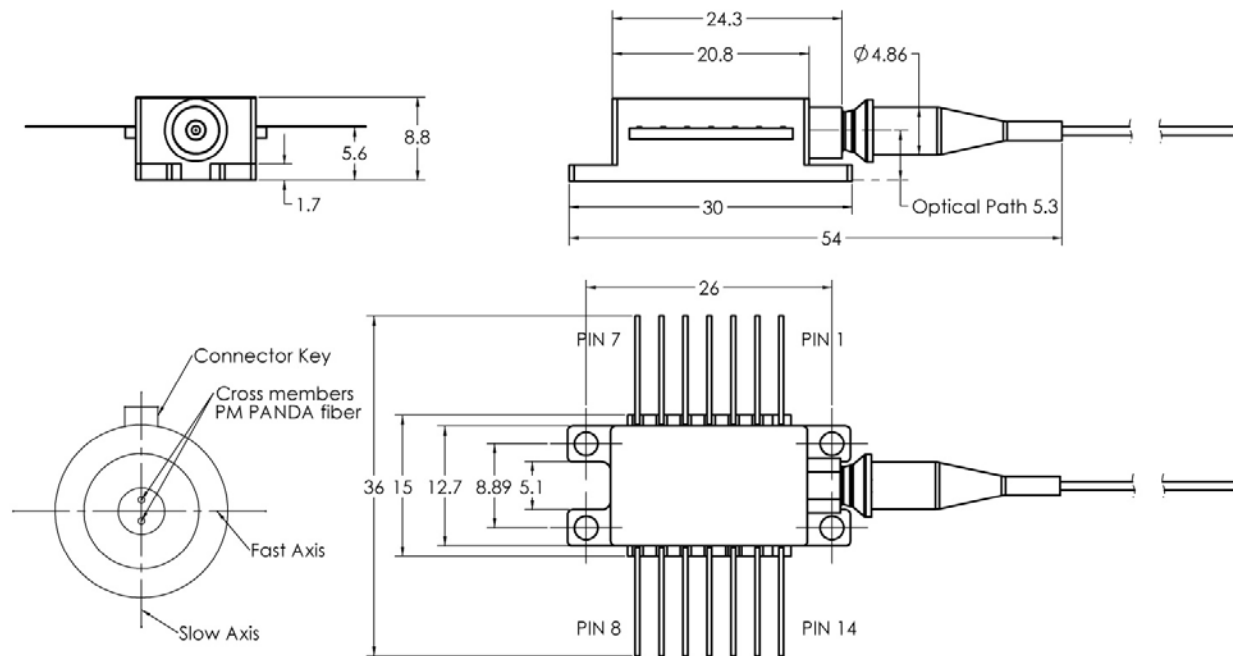
Pin-Out and Electrical Diagram

Pin	Description	Pin	Description
1	Thermistor	8	Not connected
2	Thermistor	9	Not connected
3	Laser Cathode DC Bias (-)	10	Not connected
4	Photo Diode Anode (-)	11	Laser Anode (+)
5	Photo Diode Cathode (+)	12	Cathode (RF input)
6	TEC +	13	Laser Anode (+)
7	TEC -	14	Not connected



Mechanical Diagram

Units: mm



Pigtail options (FC/APC connector):

- SMF 28, 900 μm , 1 m long
- PMF PANDA, 900 μm , 1m long, key aligned to slow axis

Ordering Information

R I O 0 1 9 X - X - X X - X									
Fiber/Connector					Phase Noise / Linewidth				
3	PMF/FC-APC Loose Tube				1	Grade 1			
4	SMF/FC-APC				3	Grade 3			
5	PMF/FC-APC				4	Grade 4			
Output Power (min.)					Wavelength and Tolerance				
2	Custom				00	1550±10 nm			
3	10 mW				01	Custom (contact RIO)			
5	20 mW				02	1550±2 nm			
					ITU	See DWDM ITU table			

DWDM ITU Wavelength¹

ITU channel number	ITU Frequency THz	Wavelength nm	ITU channel number	ITU Frequency THz	Wavelength nm	ITU channel number	ITU Frequency THz	Wavelength nm
15	191.50	1565.50	30	193.00	1553.33	45	194.50	1541.35
16	191.60	1564.68	31	193.10	1552.52	46	194.60	1540.56
17	191.70	1563.86	32	193.20	1551.72	47	194.70	1539.77
18	191.80	1563.05	33	193.30	1550.92	48	194.80	1538.98
19	191.90	1562.23	34	193.40	1550.12	49	194.90	1538.19
20	192.00	1561.42	35	193.50	1549.32	50	195.00	1537.40
21	192.10	1560.61	36	193.60	1548.51	51	195.10	1536.61
22	192.20	1559.79	37	193.70	1547.72	52	195.20	1535.82
23	192.30	1558.98	38	193.80	1546.92	53	195.30	1535.04
24	192.40	1558.17	39	193.90	1546.12	54	195.40	1534.25
25	192.50	1557.36	40	194.00	1545.32	55	195.50	1533.47
26	192.60	1556.55	41	194.10	1544.53	56	195.60	1532.68
27	192.70	1555.75	42	194.20	1543.73	57	195.70	1531.90
28	192.80	1554.94	43	194.30	1542.94	58	195.80	1531.12
29	192.90	1554.13	44	194.40	1542.14	59	195.90	1530.33

1. Standard wavelength tolerance is +/-40pm

Laser Safety Information

The PLANEX laser is classified as FDA/CDRH Class IIb laser products per CDRH, 21 CFR 1040 laser safety requirements, and complies as Class 3R laser product per international standard IEC 60825-1, 2014.

DANGER

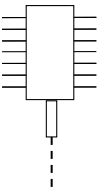
INVISIBLE LASER RADIATION

AVOID DIRECT EYE EXPOSURE



OUTPUT POWER: 50 mW max
WAVELENGTH: 1.53~1.57 μm
BEAM DIVERGENCE AT FIBER OUTPUT: 0.21 rad
CLASS IIb LASER, CDRH, 21 CFR 1040
CLASS 3R LASER, IEC60825-1

LASER APERTURE



AVOID EXPOSURE
Invisible laser radiation is emitted from end of fiber or connector