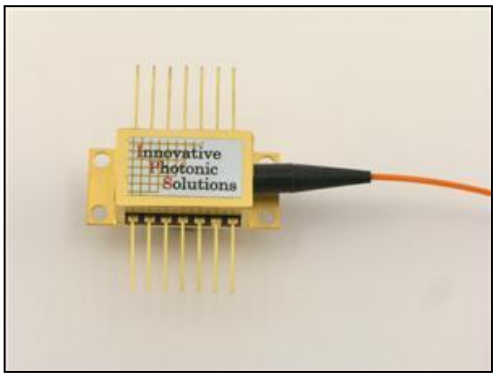
RPMC Lasers, Inc.
203 Joseph St. • O'Fallon, MO 63366 • PH: 636-272-7227
www.rpmclasers.com • info@rpmclasers.com

High Peak Power Fiber Seeds & Efficient Stabilized Pumps

RoHS COMPLIANT



Features

- Ultra-Narrow Spectral Bandwidth (< 100kHz Instantaneous for single-mode diodes)
- "Ultra-Track" Linear Tracking Photodiode
- Temperature Stabilized Spectrum (< 0.007 nm/^{0}C)
- Low Power consumption
- 55 dB SMSR Typical

RPMC utilizes a unique technology known as 'Wavelength Stabilization' to assemble a Hybrid External Cavity Laser (HECL). This technology allows us to "Lock" the laser to the desired spectral line AND shape the spectral output. It also allows us to manufacture extremely stable single frequency seed lasers that can be pulsed at very high speed – generating exceptionally high peak power levels.

Seeding

Designed to replace expensive DFB and external cavity lasers, RPMC's Wavelength Stabilized Lasers offer superior wavelength stability over time, temperature (<0.007 nm/^{0}C), and vibration, and are manufactured to meet the most demanding wavelength requirements. These sources are well suited for frequency doubling, fiber laser pumping & seeding, and remote sensing applications. RPMC's single frequency lasers may be pulsed or operated in CW mode and are a core building block in many high performance laser systems.

Standard Seed Wavelengths

- 1030 nm
- 1053 nm
- 1064 nm
- 1064.0 nm
- 1064.1 nm
- 1064.3 nm
- 1064.4 nm

Isolator available for 1030 nm, 1053 nm & 1064 nm wavelengths

Additional wavelengths available upon request

Standard Single-Mode Core Pumps

- 976 nm, 220 mW

Standard Multi-Mode Cladding Pumps

- 976 nm, 4 W
- 976 nm, 6 W

Other seed wavelengths available upon request

Pumping

RPMC's technology allows us to make high power, wavelength stabilized pump lasers that keep "ALL of the power, in the band, ALL of the time." We offer both single-mode PM fiber coupled "core" pumps and multi-mode "cladding" pumps. These pumps are significantly more efficient than traditional non-stabilized devices, enabling the use of shorter lengths of fiber which, in turn, reduces non-linear effects. This facilitates the manufacture of higher power laser systems.

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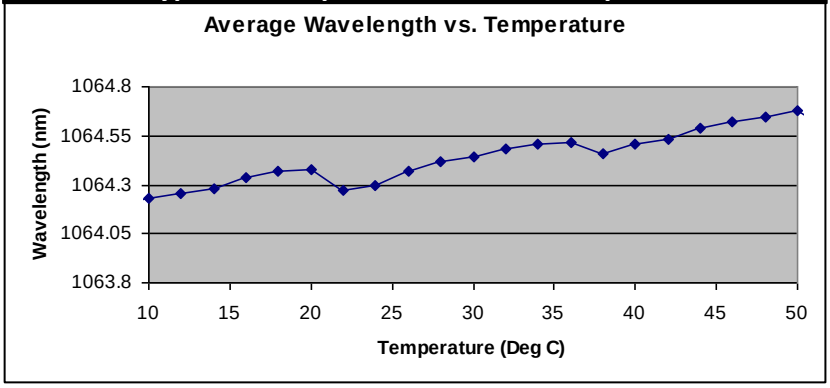
High-Peak Power Single-Mode Seeds

RPMC's unique Wavelength Stabilization technology allows us to manufacture extremely stable single frequency seed lasers that can be operated in CW mode or pulsed at very high speed – generating exceptionally high peak power levels. These sources are becoming the industry standard for fiber laser and solid-state laser seeding applications and are available in several configurations and at a wide variety of wavelengths.

Typical OSA Spectral Plot & Pulse Spectrum



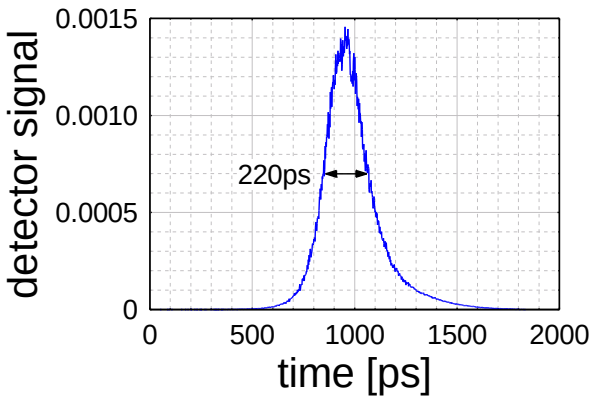
Laser exhibits characteristics of both DFB and ECL lasers

High Peak Power Pulsed Seeds

- Pulse Width < 100 ps to CW
- PM Fiber Coupled

RPMC high power pulsed seed sources are ideal for use in high peak power pulsed fiber laser systems. Although the seeder is very narrow linewidth, the capability to over-drive the laser to obtain very high peak power levels make these devices better solutions than traditional DFB lasers when Stimulated Brillouin Scattering (SBS) is a concern. These sources, in coordination with RPMC's line of spectrum stabilized core and cladding pumps, offer fiber laser manufacturers a unique technological approach to push the limits on their high peak power pulsed fiber laser systems.

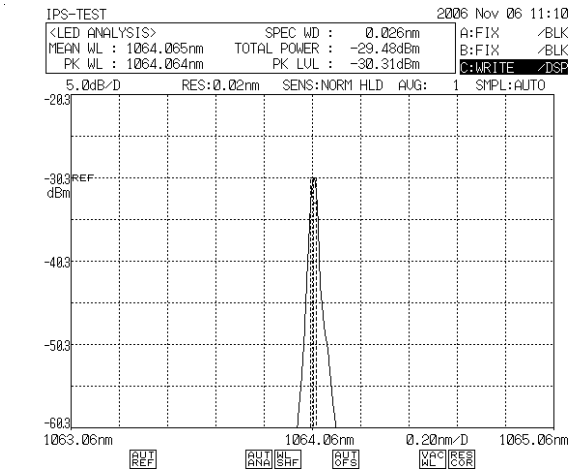
Operation During Pulse



220 ps pulse width 0 - 750 mA Modulation

Ultra-Stable Continuous Wave Seeds

Typical Single-Mode 1064 nm Plot



1064 nm Wavelength Stabilized Laser Spectrum @ 25 deg C

- High Performance CW Operation
- Ultra-Low Phase Noise
- Spectral Linewidth < 100 kHz (Instantaneous)
- Available with Integral Dual Stage Isolator

RPMC's ultra-stable seed sources are ideal for CW seeding of both fiber and solid state laser systems. With instantaneous spectral linewidth of < 100 kHz (it has been measured as low as 20 kHz) and low phase noise, these sources offer superior reliability and performance and are ideal for use when system requirements call for ultra stable and precise wavelength control. RPMC can custom manufacture these lasers within +/-0.1 nm to meet your exacting wavelength specifications.

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High Peak Power Single-Mode Seeds Specifications

General Optical Specifications	
Wavelength Tolerance	+/- 0.5 nm[1]
Spectral Linewidth (Δλ)	< 100 kHz Typical
Wavelength Stability Range	15 C - 45 C
SMSR	35 -45 dB
Fiber	Polarization Maintaining, Panda Type
Polarization Orientation	IPS standard is PM slow. The "P" in part number signifies PM slow. Substitute "F" for PM fast
Polarization Extinction Ratio (PER)	>17 dB
Output Power Stability	1% typical
Peak Wavelength Drift	+/- 7pm assuming TEC control +/- 0.1 degree C

General Electrical Specifications	
TEC Current Limit	2.0 Amperes
TEC Voltage Limit	4.5 V
Photodiode Current	30 uA
Integral Thermistor	See Thermistor section on p.10

Single-Mode Packaging Types	
Standard 14-pin BF Package	See Products Table for package type of each product, Drawing and Pinout on p.9
Extended 14-pin BF Package	See Products Table for package type of each product, Drawing and Pinout on p.9

Wavelength (nm)	Min. Power (mW)	Part Number	Max Current/ Compliance Voltage	Connector	Wavelength Tolerance	Package Type
1030	50 (integral dual-stage isolator)	R1030SB0050P-IS	350 mA, 2.2V	unterminated	+/- 0.5 nm	Extended
		R1030SB0050PA-IS		FC/APC	+/- 0.5 nm	
	100	R1030SB0100P	400 mA, 2.2V	unterminated	+/- 0.5 nm	Standard
		R1030SB0100PA		FC/APC	+/- 0.5 nm	
	280	R1030SB0280P	750 mA, 2.2V	unterminated	+/- 0.5 nm	Extended
		R1030SB0280PA		FC/APC	+/- 0.5 nm	
1053	120	R1053SB0120P	400 mA, 2.2V	unterminated	+/- 0.5 nm	Standard
		R1053SB0120PA		FC/APC	+/- 0.5 nm	
	300	R1053SB0300P	750 mA, 2.2V	unterminated	+/- 0.5 nm	Extended
		R1053SB0300PA		FC/APC	+/- 0.5 nm	
1064	50 (integral dual-stage isolator)	R1064SB0050P-IS	350 mA, 2.2V	unterminated	+/- 0.5 nm	Extended
		R1064SB0050PA-IS		FC/APC	+/- 0.5 nm	
	120	R1064SB0120P	400 mA, 2.2V	unterminated	+/- 0.5 nm	Standard
		R1064SB0120PA		FC/APC	+/- 0.5 nm	
	300	R1064SB0300P	750 mA, 2.2V	unterminated	+/- 0.5 nm	Extended
		R1064SB0300PA		FC/APC	+/- 0.5 nm	
1064.X (substitute 0, 1, 3, 4 for "X", wavelength measured in vacuum)	50 (integral dual-stage isolator)	R1064.XSB0050P-IS	350 mA, 2.2V	unterminated	+/- 0.1 nm	Extended
		R1064.XSB0050PA-IS		FC/APC	+/- 0.1 nm	
	120	R1064.XSB0120P	400 mA, 2.2V	unterminated	+/- 0.1 nm	Standard
		R1064.XSB0120PA		FC/APC	+/- 0.1 nm	
	300	R1064.XSB0300P	750 mA, 2.2V	unterminated	+/- 0.1 nm	Extended
		R1064.XSB0300PA		FC/APC	+/- 0.1 nm	

1 - If 1064.0 nm, 1064.1 nm, 1064.3 nm or 1064.4 nm is ordered, wavelength tolerance is +/- 0.1 nm. Wavelength is measured in vacuum for 1064.X

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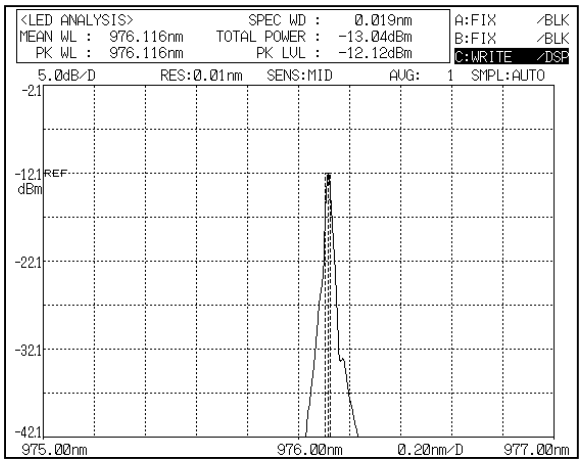
976 nm Single-Mode Core Pump



976 nm Wavelength Stabilized Laser Spectrum @ 25 deg C

Features

- Ultra-Low Noise Operation
- PM Fiber Coupled Output Power
- Spectral Linewidth <100 kHz

RPMC's single frequency pumps offer high power and ultra-low noise – making them ideal sources for pumping DFB fiber lasers. Utilizing a low noise, high SMSR pump in high performance CW fiber lasers enables the realization of lower phase noise due to reduced pump induced thermal fluctuation.

976 nm Single-Frequency Core Pump Specifications	
Package and Part Number	
R0976SB0220P	220 mW, Unterminated Connection
R0976SB0220PA	220 mW, FC/APC Conntector
Package Type	Standard
Optical Specifications	
Wavelength Tolerance	+/- 0.5 nm[1]
Spectral Linewidth (Δλ)	< 100 kHz Typical
Wavelength Stability Range	15 C - 45 C
SMSR	35 -45 dB
Fiber	Polarization Maintaining, Panda Type
Polarization Orientation	IPS standard is PM slow. The "P" in part number signifies PM slow. Substitute "F" for PM fast
Polarization Extinction Ratio (PER)	>17 dB
Output Power Stability	1% typical
Peak Wavelength Drift	+/- 7pm assuming TEC control +/- 0.1 degree C
Electrical Specifications	
Max Current	400 mA
Compliance Voltage	2.2 V
TEC Current Limit	2.0 Amperes
TEC Voltage Limit	4.5 V
Photodiode Current	30 uA
Integral Thermistor	See Thermistor Coefficients p. 10

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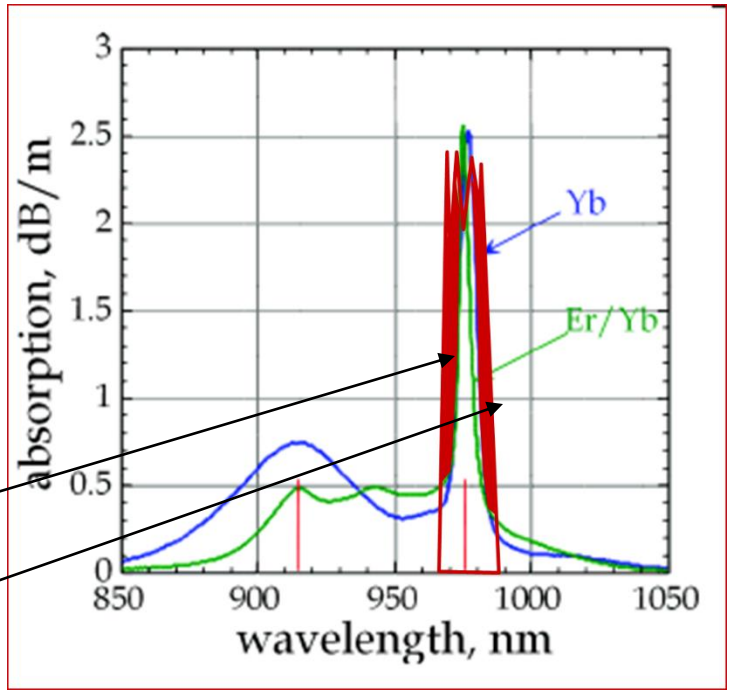
Multi-Mode Cladding Pumps

RPMC's unique 4W and 6 W wavelength stabilized multi-mode laser pumps provide wavelength locked pumping that remains "***in the band – all of the time***" without the need for costly and complicated temperature control. These sources eliminate the need for "binning" of like wavelength pumps, and therefore are more cost effective for use when total system integration costs are considered.

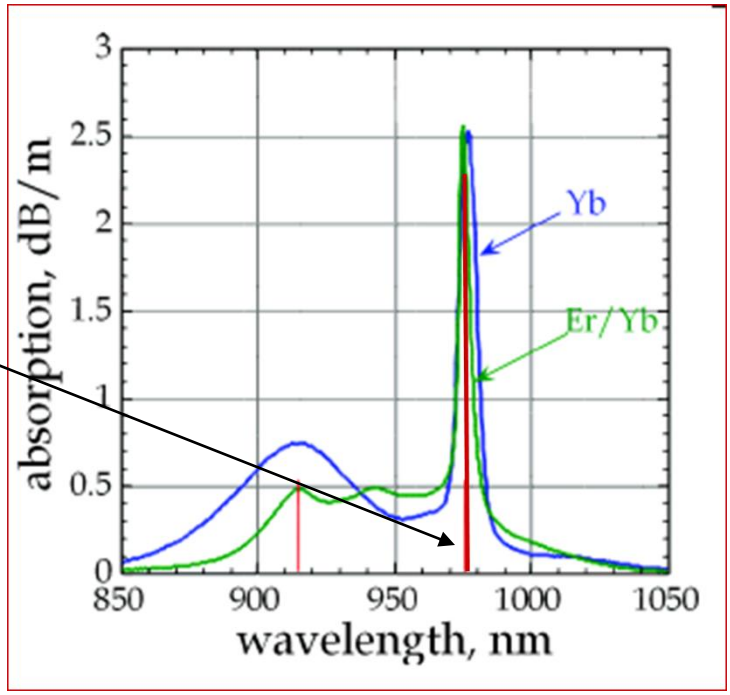
The most important characteristic that these sources provide is the ability to dramatically shorten the fiber length. By locking all of the power in the absorption band, pump light is absorbed more rapidly and more efficiently than traditional pump sources. This allows users to reduce the number of pumps required AND reduce the length of fiber used. In turn, this reduces the non-linear effects and aids in suppression of Stimulated Brillouin Scattering (SBS).

Typical 976 nm MM Pump



Roughly ½ of the power is outside of the high efficiency band!

RPMC Wavelength Stabilized 976 nm MM Pump



ALL of the Power
In The Band
ALL of the time!

Laser Locked with No Side-Modes Over Entire Range From 30^0 C – 55^0 C

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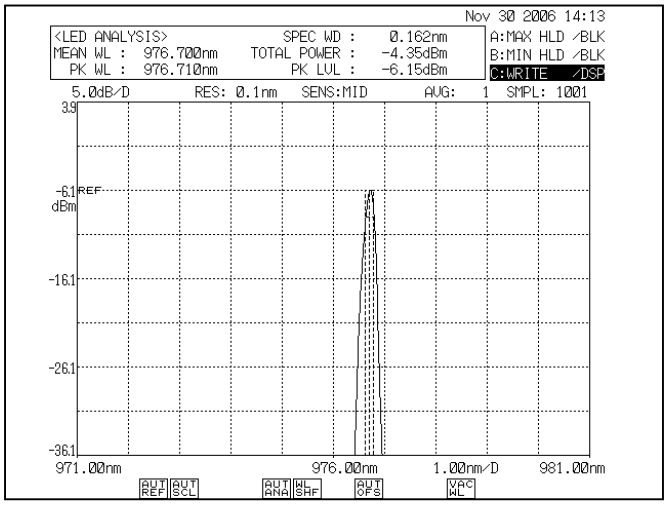
Multi-Mode Cladding Pump Specifications

General Optical Specifications	
Optical Performance Specifications	
Wavelength Tolerance	+/- 0.5 nm
Spectral Linewidth ($\Delta\lambda$)	0.15 nm Typical, <0.25 nm max
Fiber	100/105 micron core multi-mode (MM) fiber 0.22 N.A.
Wavelength Stability Range	30 C - 50 C
SMSR	35 -45 dB typical
Output Power Stability	+/- 1% typical
Peak Wavelength Drift	+/- 0.1 nm over life
Other Specifications	
Photodiode Current	30 uA
Integral Thermistor	See Thermistor coefficients on p.10

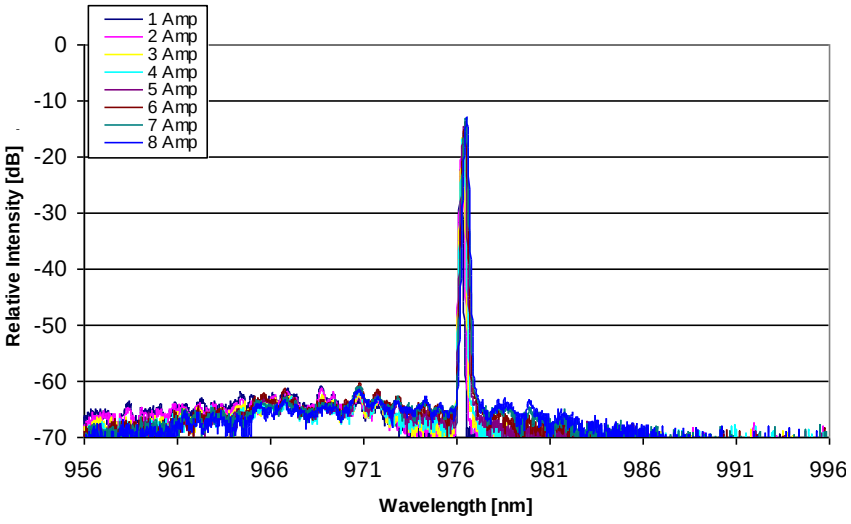


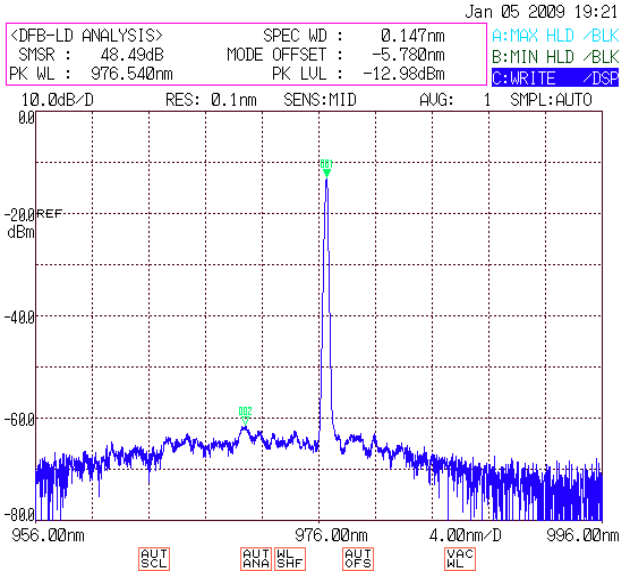
976 nm Output Spectra @ 6 W and 35^0 C Case Temp

Wavelength (nm)	Min. Power	Part number	Max Current/ Compliance Voltage	Connector
976	4 W	R0976MB4000M	6000 mA, 2.2V	unterminated
		R0976MB4000MF		FC/PC
		R0976MB4000MS		SMA
	6 W	R0976MB6000M	9000 mA, 2.2V	unterminated
		R0976MB0600MF		FC/PC
		R0976MB6000MS		SMA

Note:
Please note that the 976 nm 4W and 6W lasers remain fully locked between 30 and 50 degrees C (heatsink), so you won't need TEC controllers if you have adequate airflow over your heatsink.

Spectrum-Stabilized 976 nm Pump Laser





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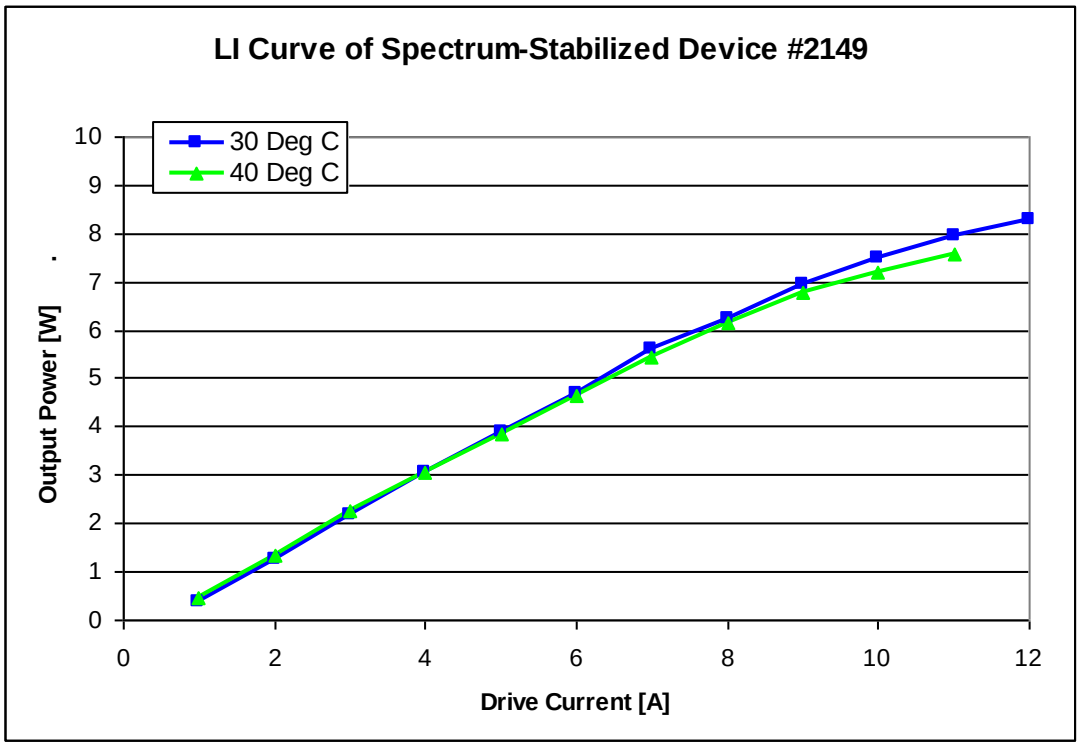
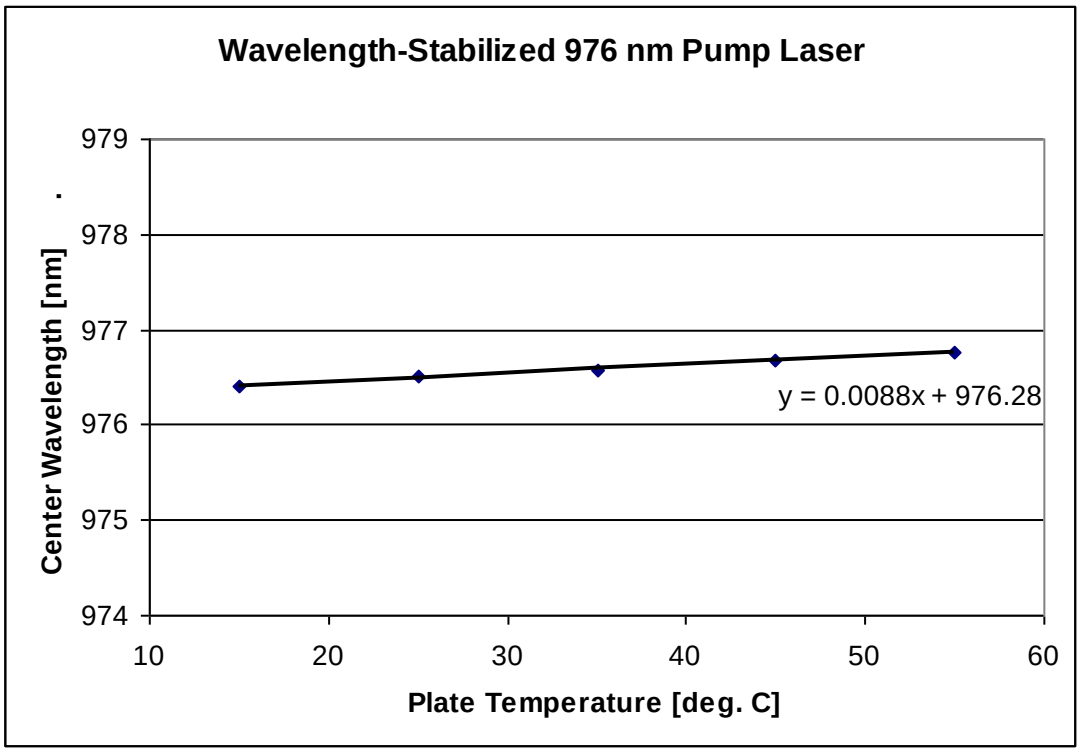
Multi-Mode Cladding Pump Data

Laser Model #'s R0976MB4000M & R0976MB6000M





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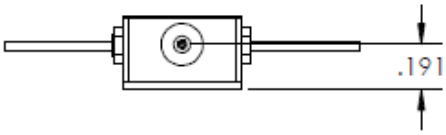
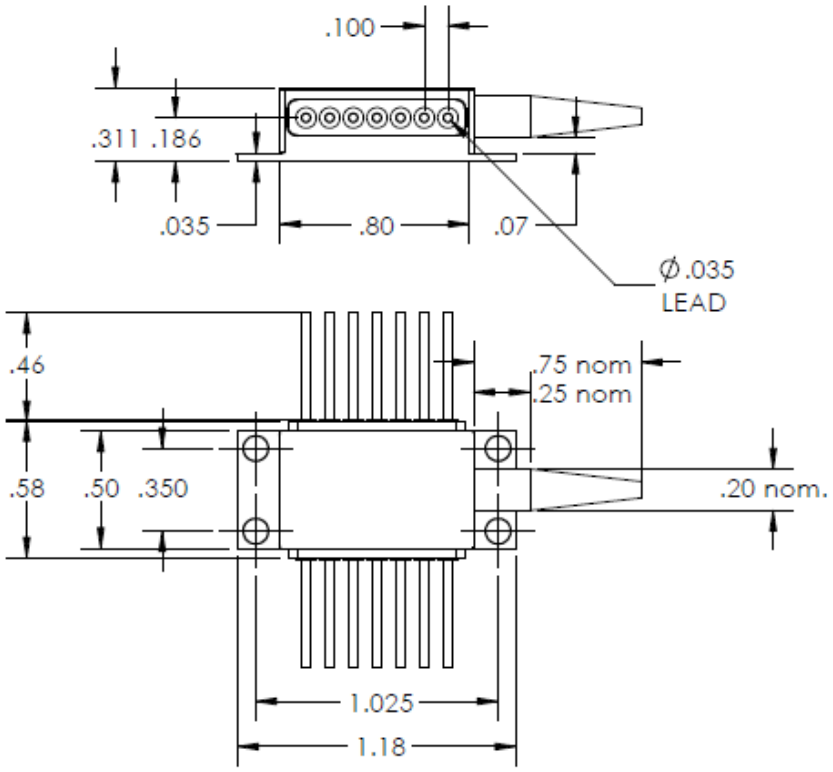
Mechanical Specifications
High Power 14-pin BF Package





INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION
CLASS 4 LASER PRODUCT
976 nm, 7W CW
EN/IEC 60825-1:2007

OEM Laser Product

This laser module is designed for use as a component (or replacement) part and is thereby exempt from 21 CFR1040.10 and 1040.11 provisions.

Operational Notes High-Power MM Pumps

1. 14-pin BF should be mounted on a heat sink with a thermal compound (thermal grease)
2. User MUST employ the use of thermal interface pad or thermal grease in order to maintain a thermistor temperature reading between 25 and 50 deg C.
3. When laser is running at full drive current, the internal thermistor temperature is expected to be between 5 and 10 degrees higher than outside heat sink.
4. Take care not to over-tighten screws when mounting. This can bend the BF package causing damage and hindering performance, and is not covered under warranty.
5. Driver circuitry should be configured in a manner to prevent power surges and power spikes.
6. RPMC recommends not grounding anode and cathode as this can cause ground loops.

High Heat BF Module Pinout

Pin #	Name
1	NC
2	THERMISTOR (10K Ohm @ 25C)
3	PD ANODE
4	PD CATHODE
5	THERMISTOR
6	LASER ANODE (+) [3 A MAX]
7	LASER ANODE (+) [3 A MAX]
8	LASER ANODE (+) [10 A MAX]
9	LASER CATHODE (-) [10 A MAX]
10	LASER ANODE (+) [10 A MAX]
11	LASER CATHODE (-) [10 A MAX]
12	NC
13	NC
14	NC

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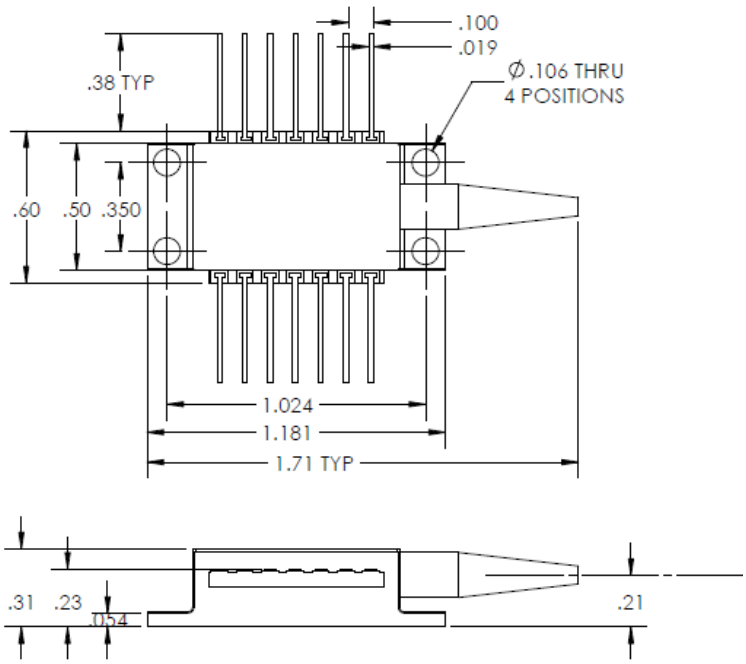
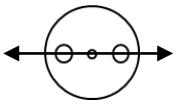
Mechanical Specifications 14-Pin BF

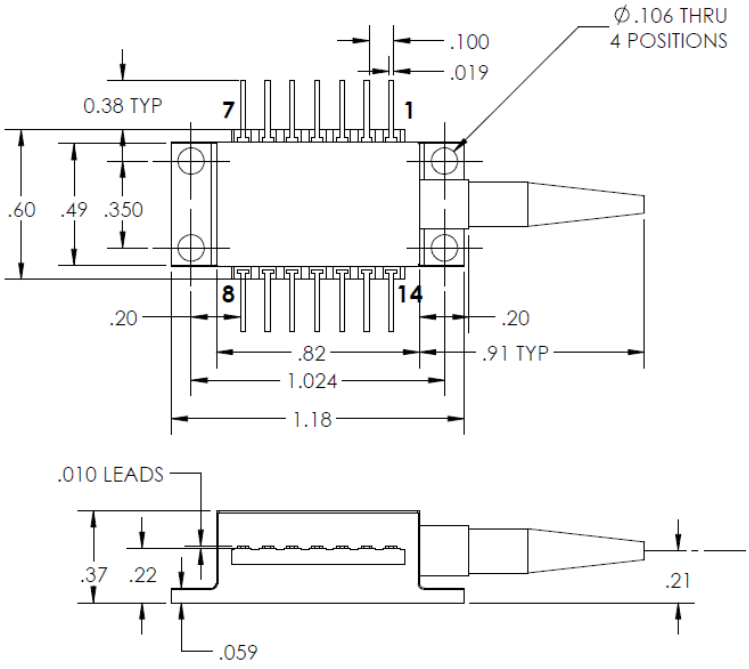
Standard 14-Pin BF Package

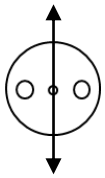




PM Slow – RPMC Slow Axis Standard Polarization Orientation

Extended 14-Pin BF Package





PM Fast – If PM Fast is desired, this must be specified by replacing the "P" in the part number with "F"

INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION
CLASS 4 LASER PRODUCT
976 nm, 7W CW
EN/IEC 60825-1:2007

INVISIBLE LASER RADIATION
AVOID EXPOSURE TO BEAM
CLASS 3B LASER PRODUCT
976 nm,1030 nm, 1053 nm,
1064 nm, 400 mW CW
EN/IEC 60825-1:2007

RoHS
COMPLIANT

See Operational Notes on p.10

OEM Laser Product

This laser module is designed for use as a component (or replacement) part and is thereby exempt from 21 CFR1040.10 and 1040.11 provisions.

Electrical Pinout	
1	TEC +
2	THERMISTOR (10K Ohm @ 25C)
3	PD ANODE
4	PD CATHODE
5	THERMISTOR
6	NC
7	NC
8	NC
9	LASER CATHODE (-)
10	LASER ANODE (+)
11	LASER CATHODE (-)
12	NC
13	CASE GROUND
14	TEC -

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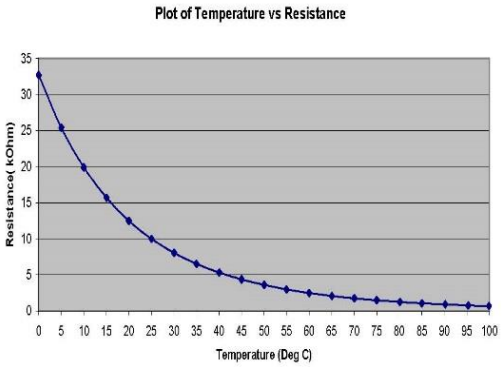
Thermistor

Formula for calculating T based upon Resistance
1/(C1+C2*LN(kOhm*1000)+C3*(LN(kOhm*1000))^3)-273.15

Thermistor (Betatherm 10K3CG3)
C1 0.00113 C2 0.000234 C3 8.78E-08



Temperature [C]	Resistance [kOhm]
100	0.68
95	0.78
90	0.91
85	1.07
80	1.25
75	1.48
70	1.75
65	2.08
60	2.49
55	2.99
50	3.6
45	4.37
40	5.32
35	6.54
30	8.05
25	10
20	12.5
15	15.7
10	19.9
5	25.4
0	32.7

Operational Notes Single-Frequency Diodes

1. 14-pin BF should be mounted on a heat sink with a thermal compound (thermal grease)
2. Do not retro-reflect beam! This can cause Catastrophic Optical Damage (COD) and is not covered under warranty unless the unit has an integral optical isolator (e.g. I1064SB0050P-IS).
3. Laser will operate in single frequency mode at set-points between 10 and 45 degrees, however, optimal operating set point must be determined for each laser diode to avoid mode-hopping (see note 4)
4. To determine optimal operating point, plot output power vs temperature to determine where mode-hop locations are. Set operating temperature halfway between mode-hops. This will ensure the most stable operation (RPMC can offer the option of determining this optimal operating point for each diode)
5. Take care not to over-tighten screws when mounting. This can bend the BF package causing damage and hindering performance, and is not covered under warranty.
6. Driver circuitry should be configured in a manner to prevent power surges and power spikes.
7. RPMC recommends not grounding anode and cathode as this can cause ground loops.

Part Numbering Schema