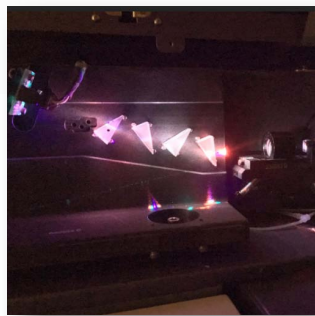




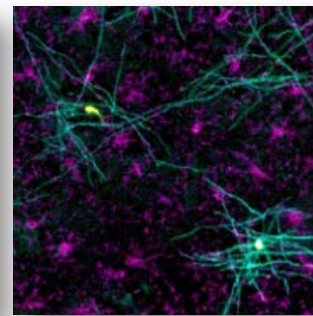
PHOTONICS SOLUTIONS **PRECISELY DESIGNED** **FOR YOU**
 LASERS & DETECTORS covering UV to IR and tailored to your application to be successful



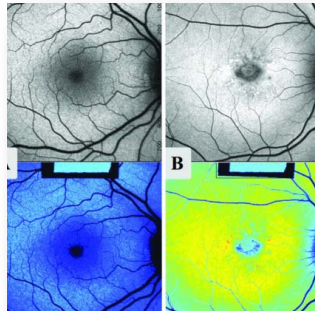
Flow Cytometry



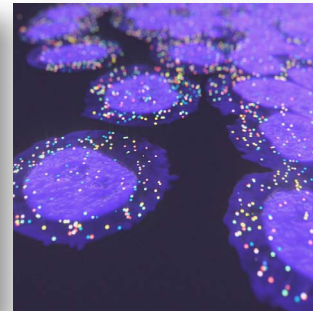
DNA Sequencing



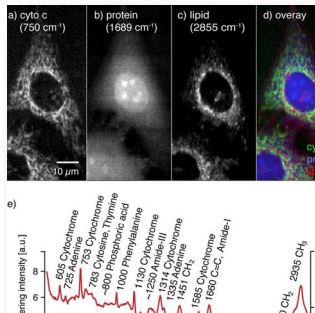
Confocal Microscopy



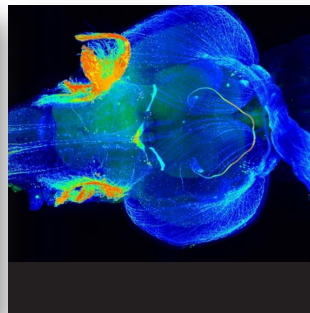
Ophthalmology



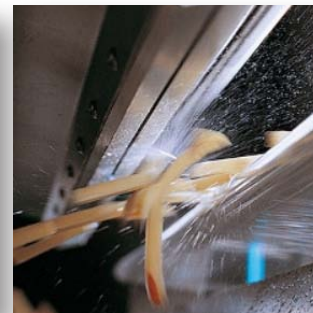
Spatial Genomics



Raman Spectroscopy



Lightsheet Imaging



Food Sorting

For Biomedical & Sensing Applications
 Lasers | Detectors | OEM Engines



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Pavilion Vision

Pavilion Integration Corporation (PIC), is a Silicon Valley-based manufacturer of free space and fiber-coupled laser modules, detectors and optical engine subsystems covering the UV, Visible and IR wavelength ranges for demanding biomedical and industrial applications. PIC's WhisperIT®, Lapis®, Comet® and Shiva® platforms utilize a patented technology that creates a beam with excellent mode quality, low noise under all conditions, and low speckle, but at a substantially reduced cost and power consumption.

We chose the name Pavilion Integration Corporation for our company in November 2001 envisioning a place that allows us (customer and vendor) to openly discuss in mutual trust, and to work out leading edge design solutions that will enter the marketplace in disruptive ways to literally light the darkness of disease and discovery.

“And there shall be a pavilion for a shade in the day-time from the heat, and for a refuge and for a covert from storm and from rain”.

– Isa. 4:6

“Who can understand how he spreads out the clouds, how he thunders from his pavilion?”

- Job 36: 29

History of Innovation

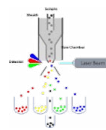
PIS is leading the evolution of lasers in healthcare applications



The first low coherence, low noise laser introduced in 1/2004



Multi-laser platform introduced 11/2005



In July, 2006 Single laser & Multi-laser platform getting into the FCM and confocal microscopy



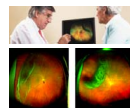
In 2010 Single laser & Multi-laser platform for the Next gen DNA sequencing & arrestee testing application



In 2013 High-power platform for the 2nd gen High-throughput DNA sequencing



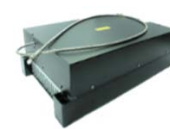
From July, 2005 Helping the third World for the HIV testing



From Jan, 2006 Helping ophthalmology for Retail screening testing



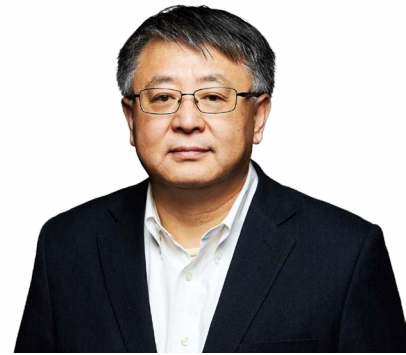
Compact single platform introduced 2010



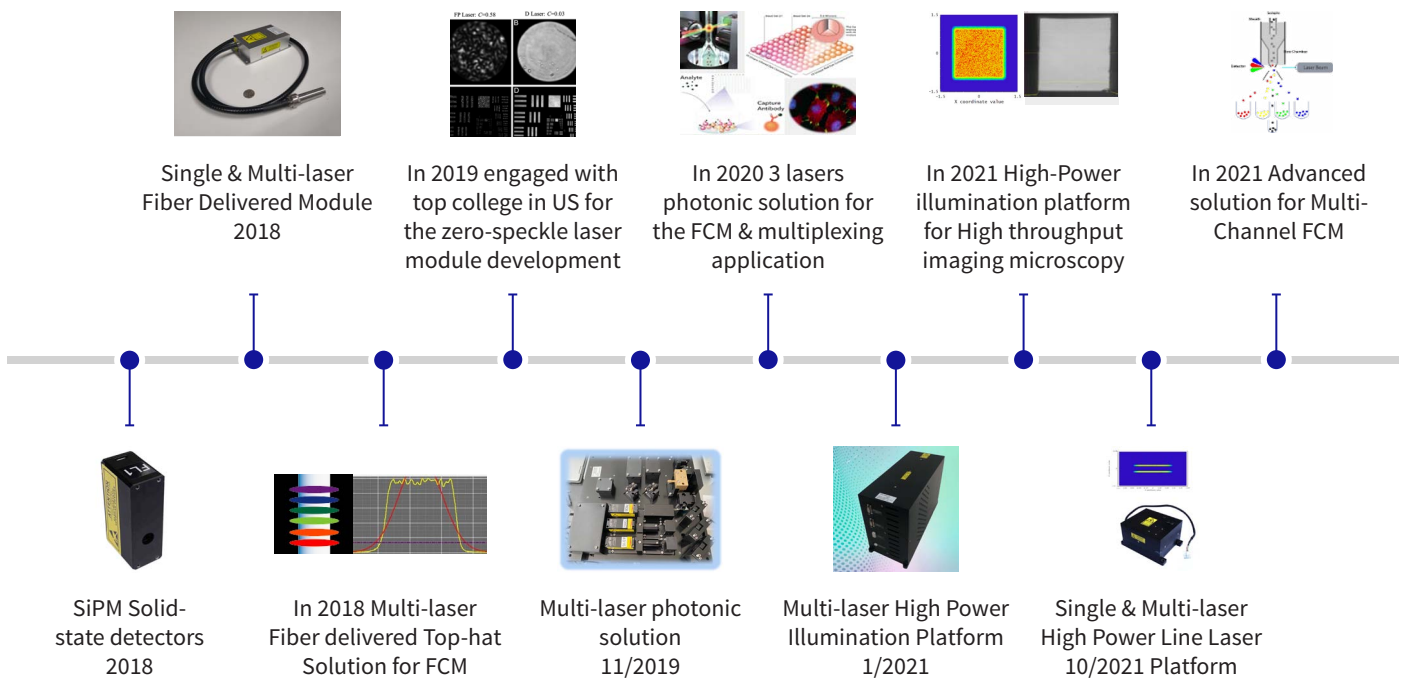
High-Power platform introduced 2013

Invitation to Partner

“PIC is about making sure our customers’ have a competitive advantage by providing them with the lowest overall system cost solution while meeting just-in time needs. We differentiate along many dimensions, but foremost is our focus on and level of service we provide to our customers.”



Co-Founder,
President & CEO



Bring Your Applications to the Next Level of Reliability & Performance

Quality & Reliability

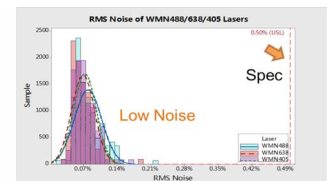
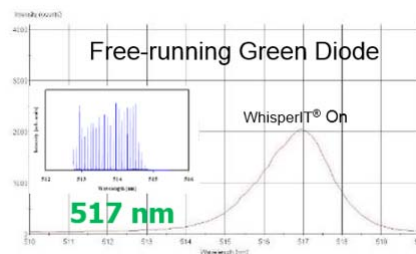
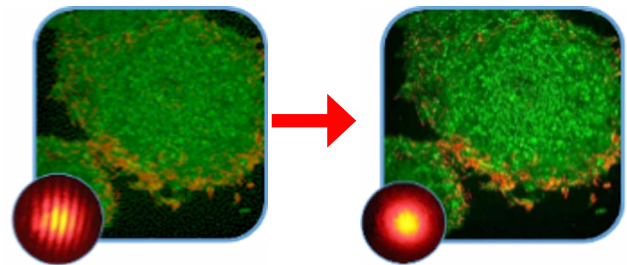
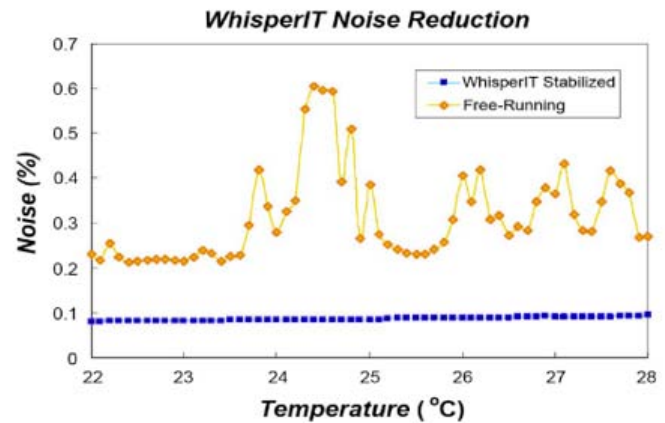
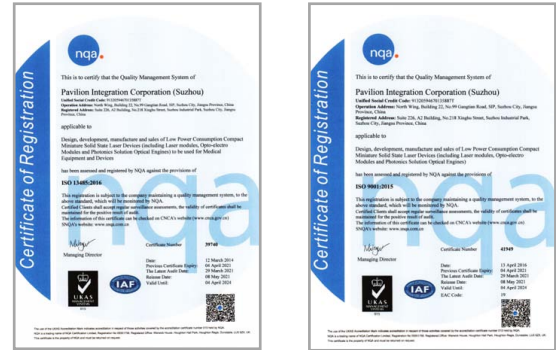
- » ISO9001/13485 since 2009
- » Life-time >30,000 hours
- » History of over 100,000 units shipped

Performance

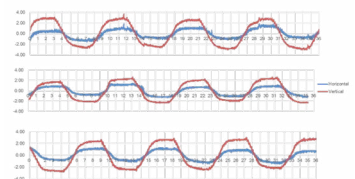
- » Low Noise
- » Low Coherence
- » Low Speckle
- » Mode Hop Free
- » Excellent beam pointing
- » stability over temperature and humidity

Applications

- » Ophthalmology
- » Flow Cytometry
- » DNA Sequencing
- » Forensics
- » Confocal Microscopy
- » Neuroscience
- » IVD/POC



Exceptional pointing stability



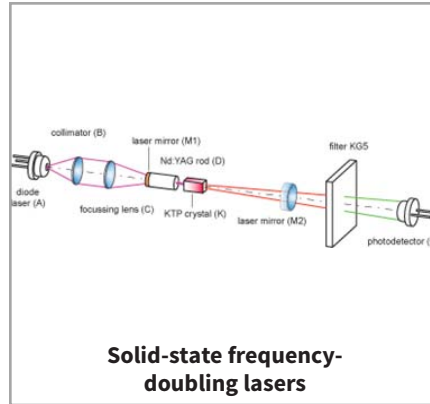
Laser Evolution

1st Gen Laser Air-cooled gas



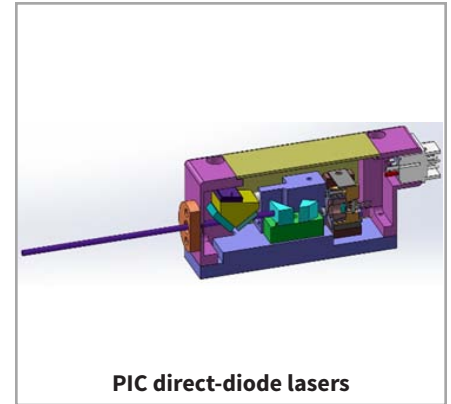
- » Big size
- » Short life time
- » High heat consumption
- » Low cost

2nd Gen Laser DPSS



- » Compact size
- » Long life time
- » Reduced heat consumption
- » **High** cost

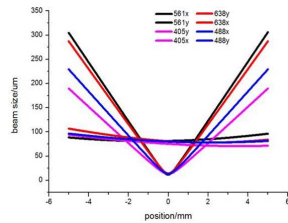
3rd Gen Laser Diode laser



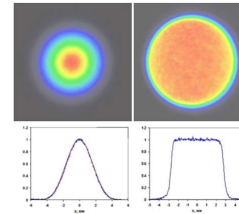
- » Very compact miniature
- » Compact beam shaping
- » Robust and reliable
- » Extremely long life time
- » Cost-effective

Beam Shaping Optics

- Round Beam
- Elliptical
- Collinear
- Rectangular



- Gaussian
- Flat-Top



High Volume Production



Introducing a Quantum Shift in Performance with PICel[®] technology

PIC's optically pumped PICel[®] (photonic integrated cavity emitting laser) technology-based platform, represents the first compact OEM packaged commercialization of membrane external-cavity surface-emitting laser (MECSEL) technology, promising broad wavelength flexibility and close to quantum-noise-limited performance.

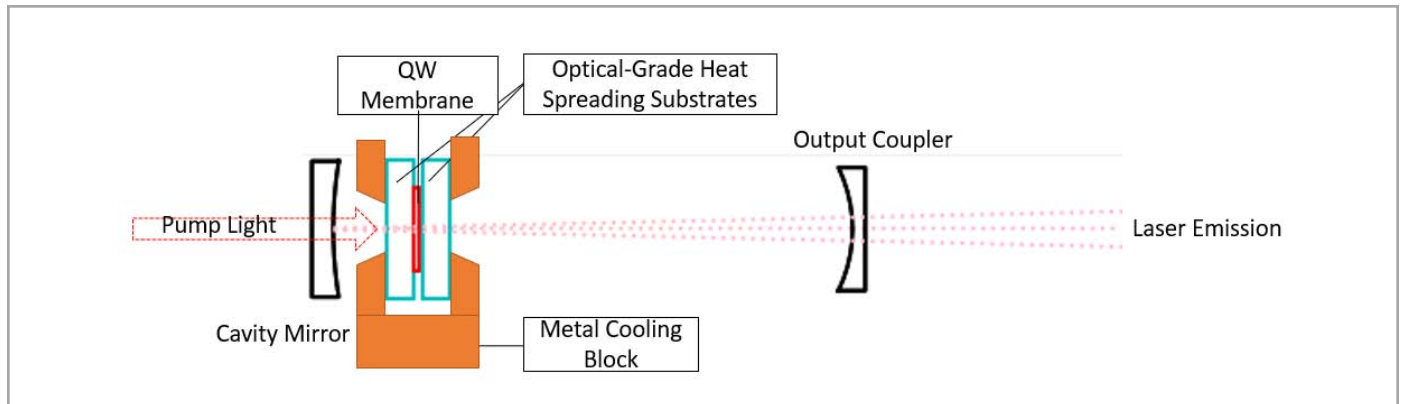


Figure 1: PICel QW Schematic Drawing

WhisperIT PICel[®] offers the wavelength coverage from 488nm to 1200nm. This includes 532nm-594nm where the direct diode lasers cannot reach.

The WhisperIT PICel[®] is part of the family of the semiconductor disk lasers (SDLs) or vertical-external-cavity surface-emitting lasers (VECSELs). Optically pumped VECSELs can generate many watt output power in the wavelength regime ranging from 650 nm to more than 2.2 μm using quantum-well (QW) and quantum-dot (QD) structures. In contrast to diode-pumped solid-state lasers, a much broader range in operation wavelength can be reached in an MECSEL and still maintain low noise performance. MECSEL covers the same wavelength range as optically pumped semiconductor laser (OPSL) because similar semiconductor material is used offering good beam quality at high power.

MECSELs takes advantage of OPSL's QW gain structure and improves its cooling by direct cooling on QW. As shown in figure 1, the heat generated in QW goes directly to heat spreaders in MECSEL vs OPSL where the heat goes through DBR before reaching heat spreader/heat sink. Therefore, much higher output power can be realized in the MECSEL compared to the OPSL. MECSEL manufacture process is based on the established semiconductor wafer process where many MECSEL chips are made in the wafer scale. This translates into lower manufacture cost.

WhisperIT PICel[®] OEM Integration Advantages

CW 100mW output	PICel [®]	OPSL	DPSSL
Beam Quality	M2≤1.1	M2≤1.1	M2≤1.2
RMS noise	<0.05%	<0.25%	<0.3%
Power Scalability	++	++	-
Power Cons. Eff.	++	+	-
Cost	\$	\$\$	\$\$\$
Lifetime	+++	++	+
Size	+++	++	-

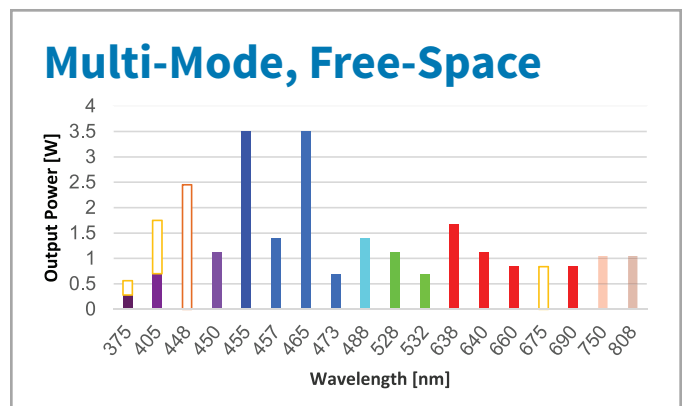
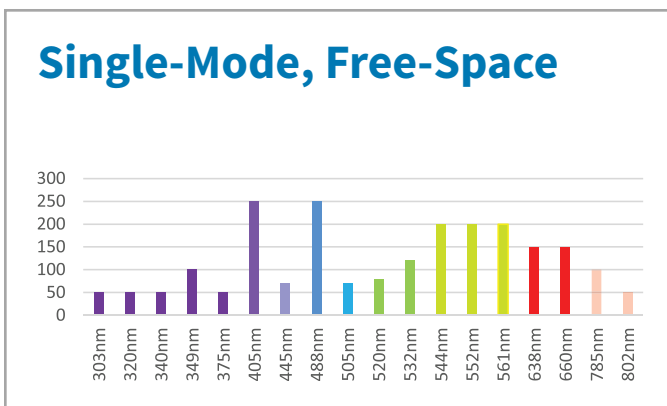
WhisperIT[®] Technology



WhisperIT[®] Standard, SL, and Mini lasers are laser diode based continuous-wave solid-state lasers that offer significantly increased lifetime, and improved efficiency over DPSS, HeCd or Argon lasers.

- » Single-mode
- » Fiber-coupled
- » High-power
- » Low-cost, reliable tube-lasers
- » Dual-band lasers
- » Multi-laser engines

Broad Range of Wavelengths and Output Powers



WhisperIT®

Whisper Standard Laser – Free Space (W-FS series)

WhisperIT® W-FS Series are laser diode-based continuous-wave solid-state lasers that offer significantly reduced footprint, increased lifetime, and improved efficiency over DPSS, HeCd, HeNe and Argon lasers. The proprietary WhisperIT® technology eliminates mode hops and delivers lasers with extremely low optical noise.

WhisperIT® W-FS Series lasers have low coherence and reduced speckle, near immunity to damage from back reflected light and the lowest noise available among all commercially available diode lasers.

WhisperIT® W-FS Series lasers benefit from Pavilion’s extensive experience in the design of rugged, low-footprint, user friendly lasers for demanding OEM applications. Utilizing long life and highly reliable laser diodes enables first-class quality laser products with great simplicity and robustness.

WhisperIT® W-FS Series lasers offer the best value for broad applications with the smallest form factors on the market today. The lasers are available with round or customized beam shape that are tailored to match specific application requirements. Ellipse and focused beam shape are also available.

FEATURES

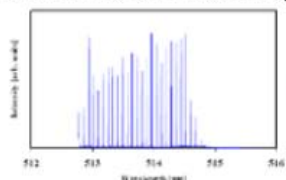
- » Ultra-Low Noise
- » Low Coherence
- » Mode-hop Free
- » Integrated Control Electronics
- » Digital, Analog Modulation

APPLICATIONS

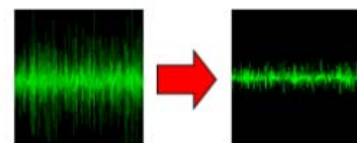
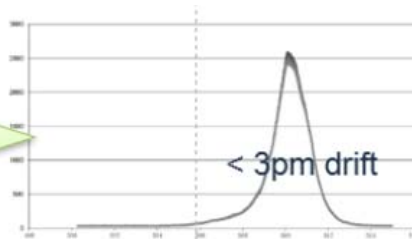
- » Flow Cytometry
- » DNA Sequencing
- » Medical Imaging
- » Confocal Microscopy
- » Optogenetics
- » Metrology
- » Semiconductor Instrumentation



Laser diode and mode hop



Whisper IT®



Low Noise

TABLE 1. OPTICAL SPECIFICATION

SPECIFICATIONS	W405	W488	W505	W515
Wavelength (nm)*	405±5	488±5	505±5	515±5
Output Power (mW)**	20,50,80, 100,150,200,250	20,50,80, 100,150,200	20,50,80	20,50,80, 100,150
RMS Noise (20Hz to 20 MHz) (%)	≤0.1	≤0.1	≤0.1	≤0.1
Peak to Peak Noise (20Hz to 20kHz) (%)	<0.5	<0.5	<0.5	<0.5
Long-Term Power Stability (8hrs, ±3°C) (%)	<2	<2	<2	<2
Spatial Mode (TEM00) M2	<1.3	<1.3	<1.3	<1.3
Beam Symmetry	≥90%	≥90%	≥90%	≥90%
Beam Diameter at 1/e2 (mm) @150mm	0.85±0.1	0.7±0.1	0.7±0.1	0.7±0.1
Beam Divergence Angle (mrad, full angle)	<1.2	<1.2	<1.4	<1.4
Pointing Stability (μrad) (over 2 hours after warm up and ±3°C)	<30	<30	<30	<30
Pointing Stability Over Temperature (μrad/°C)	<5	<5	<5	<5
Warm-Up Time (from cold start) (minutes)	<5	<5	<5	<5
Polarization Ratio (dB)	>100:1 Vertical ±5°	>100:1 Vertical ±5°	>100:1 Vertical ±5°	>100:1 Vertical ±5°

SPECIFICATIONS	W532	W561	W638	W785
Wavelength (nm)*	532±5	561±1	638±5	785±5
Output Power (mW)**	20,50,80,100	20,45	20,50,80, 100,150	20,50,80,100
RMS Noise (20Hz to 20 MHz) (%)	≤0.25	≤0.25	≤0.1	≤0.1
Peak to Peak Noise (20Hz to 20kHz) (%)	<1	<1	<0.5	<0.5
Long-Term Power Stability (8hrs, ±3°C) (%)	<2	<2	<2	<2
Spatial Mode (TEM00) M2	≤1.1	<1.3	<1.3	<1.3
Beam Symmetry	≥90%	≥90%	≥90%	≥90%
Beam Diameter at 1/e2 (mm) @150mm	0.7±0.1	0.7±0.1	0.8±0.1	0.75±0.1
Beam Divergence Angle (mrad, full angle)	<1.2	<1.5	<1.6	<1.8
Pointing Stability (μrad) (over 2 hours after warmup and ±3°C)	<30	<30	<30	<30
Pointing Stability Over Temperature (μrad/°C)	<5	<5	<5	<5
Warm-Up Time (from cold start) (minutes)	<5	<5	<5	<5
Polarization Ratio (dB)	>100:1 Vertical ±5°	>100:1 Vertical ±5°	>100:1 Vertical ±5°	>100:1 Vertical ±5°

*Other wavelengths are available

**Output power is variable in CW mode from 10% to 100% of rated power. Specifications are valid for 100% power.

TABLE 2. MECHANICAL & ENVIRONMENTAL SPECIFICATION

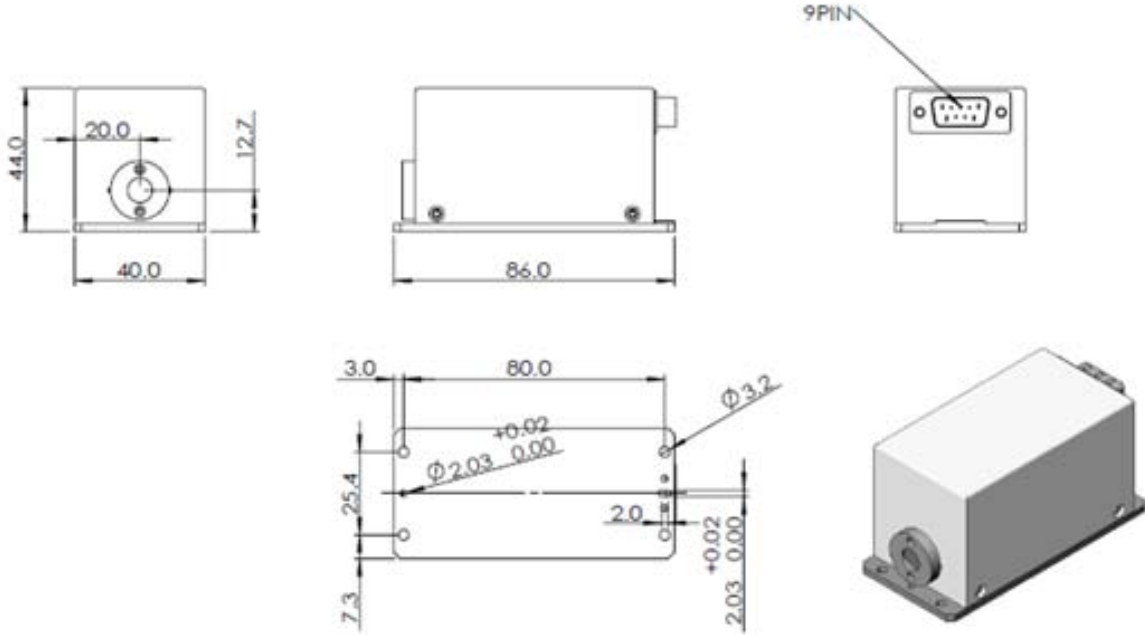
STATIC ALIGNMENT TOLERANCES	ALL WAVELENGTHS
Dimensions (L x W x H) (mm)	86 x 40 x 43
Power Consumption (W)	≤15
Laser Head Baseplate Temperature (Max. °C)	35
Heat Dissipation of Laser Head (W)	≤12
Operating Temperature (°C)	10 to 40
Storage Temperature (°C)	-20 to 60
Humidity (%) (Non-condensing)	10 to 90
Shock (11ms duration) (Operating) (g)	1
Shock (11ms duration) (Non-operating) (g)	30
Vibration (5Hz – 500Hz) (Operating) (g)	0.3
Vibration (5Hz – 500Hz) (Non-operating) (g)	3
Laser Safety Classification	3B
Vibration (5Hz – 500Hz) (Operating) (g)	0.3
Vibration (5Hz – 500Hz) (Non-operating) (g)	3
Laser Safety Classification	3b

TABLE 3. Electrical Specifications

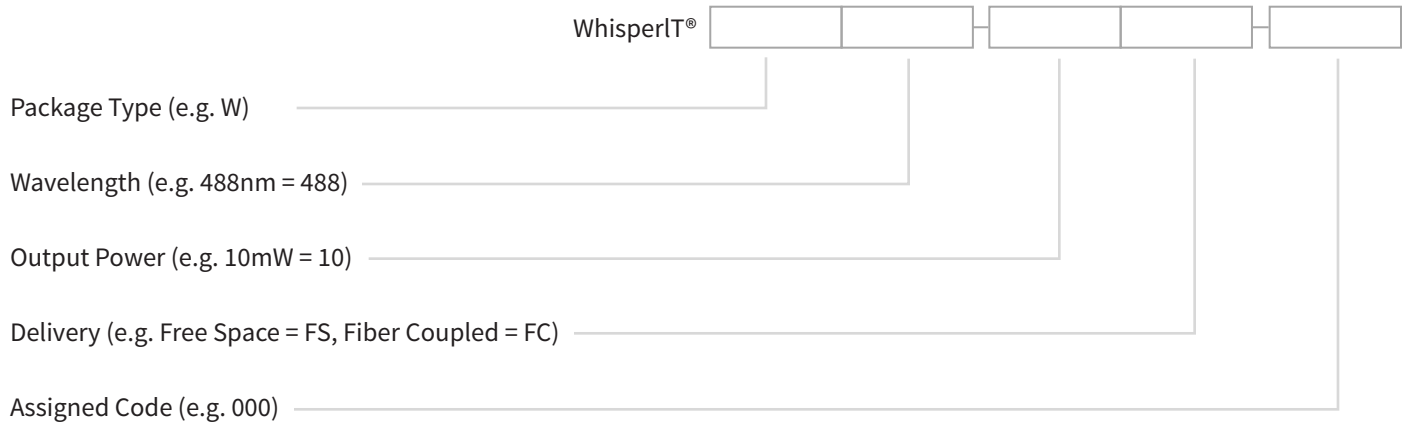
DB9 Connector PIN Assignment	Digital Interface	Analog Interface
1*	LD_9V or 5V	LD_9Vor 5V
2	Rx for RS232	NC
3	TEC_5V	TEC_5V
4	Tx for RS232	NC
5	TEC_GND	TEC_GND
6	NC	ADJ
7	NC	Enable
8	GND for RS232	NC
9	LD_GND	LD_GND

* 405/488/505/515nm LD driving voltage: 9V or 12V ;532/561/638/785nm LD driving voltage: 5V

MECHANICAL SPECIFICATIONS



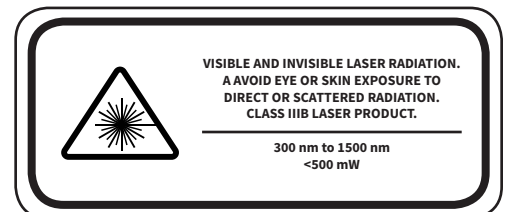
ORDER CODE



EXAMPLE: W488-10FS-000

This OEM laser does not comply with 21 CFR 1040.10 and 1040.11 without appropriate integration. Please contact Pavilion Integration Corp. for additional support or questions.

ISO9001 & ISO13485 Registered



WhisperIT®

Whisper Standard Laser – Fiber Coupled (W-FC series)

WhisperIT® W-FC Series are laser diode-based continuous-wave solid-state lasers that offer significantly reduced footprint, increased lifetime, and improved efficiency over DPSS, HeCd, HeNe and Argon lasers. The proprietary WhisperIT® technology eliminates mode hops and delivers lasers with extremely low optical noise.

WhisperIT® W-FC Series lasers have low coherence and reduced speckle, near immunity to damage from back reflected light and the lowest noise available among all commercially available diode lasers.

WhisperIT® W-FC Series lasers benefit from Pavilion’s extensive experience in the design of rugged, low-footprint, user friendly lasers for demanding OEM applications. Utilizing long life and highly reliable laser diodes enables first-class quality laser products with great simplicity and robustness.

WhisperIT® W-FC Series lasers offer the best value for broad applications with the smallest form factors on the market today. The lasers are available with round or customized beam shape that are tailored to match specific application requirements.

FEATURES

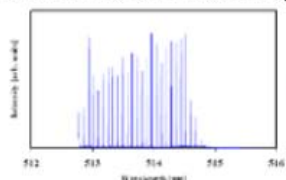
- » Ultra-Low Noise
- » Low Coherence
- » Mode-hop Free
- » Integrated Control Electronics
- » Digital, Analog or Custom Modulation

APPLICATIONS

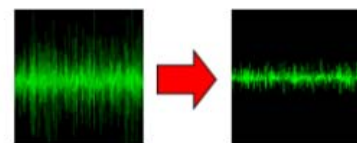
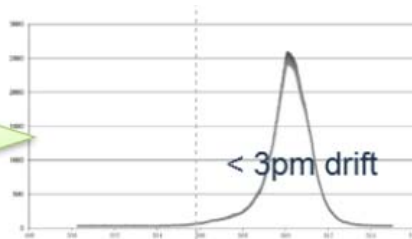
- » Flow Cytometry
- » DNA Sequencing
- » Medical Imaging
- » Confocal Microscopy
- » Optogenetics
- » Metrology
- » Semiconductor Instrumentation



Laser diode and mode hop



Whisper IT®



Low Noise

TABLE 1. OPTICAL SPECIFICATION

SPECIFICATIONS	W405	W488	W505	W515
Wavelength (nm)*	405±5	488±5	505±5	515±5
Output Power (mW)**	20, 50, 80, 100	20, 50, 80, 100, 150	20, 50	20, 50, 80, 100
RMS Noise (20Hz to 20 MHz) (%)	≤0.2	≤0.2	≤0.2	≤0.25
Peak to Peak Noise (20Hz to 20kHz) (%)	<2	<2	<2	<2
Long-Term Power Stability (8hrs, ±3°C) (%)	<2	<2	<2	<2
Spatial Mode (TEM00) M2	≤1.1	≤1.1	≤1.1	≤1.1
Beam Symmetry	≥90%	≥90%	≥90%	≥90%
Warm-Up Time (from cold start) (minutes)	<5	<5	<5	<5
Fiber Type	PM Fiber	PM Fiber	PM Fiber	PM Fiber
Fiber Jacket Diameter	3mm or 0.9mm cable	3mm or 0.9mm cable	3mm or 0.9mm cable	3mm or 0.9mm cable
Fiber Length (m)	1	1	1	1
Fiber Connector	FC/APC or FC/PC with Narrow key	FC/APC or FC/PC with Narrow key	FC/APC or FC/PC with Narrow key	FC/APC or FC/PC with Narrow key
Polarization Ratio (dB)	>50:1	>50:1	>50:1	>50:1
Polarization Orientation	Parallel or Perpendicular to the Key position.	Parallel or Perpendicular to the Key position.	Parallel or Perpendicular to the Key position.	Parallel or Perpendicular to the Key position.

SPECIFICATIONS	W532	W553/561	W638	W785
Wavelength (nm)*	532±5	561±1	638±5	785±5
Output Power (mW)**	20, 50, 80	20, 30	20, 50, 80, 100	20, 50, 80, 100
RMS Noise (20Hz to 20 MHz) (%)	≤0.25	≤0.25	≤0.2	≤0.2
Peak to Peak Noise (20Hz to 20kHz) (%)	<1	<1	<2	<2
Long-Term Power Stability (8hrs, ±3°C) (%)	<2	<2	<2	<2
Spatial Mode (TEM00) M2	≤1.1	≤1.1	≤1.1	≤1.1
Beam Symmetry	≥90%	≥90%	≥90%	≥90%
Warm-Up Time (from cold start) (minutes)	<5	<5	<5	<5
Fiber Type	PM Fiber	PM Fiber	PM Fiber	PM Fiber
Fiber Jacket Diameter	3mm or 0.9mm cable	3mm or 0.9mm cable	3mm or 0.9mm cable	3mm or 0.9mm cable
Fiber Length (m)	1	1	1	1
Fiber Connector	FC/APC or FC/PC with Narrow key	FC/APC or FC/PC with Narrow key	FC/APC or FC/PC with Narrow key	FC/APC or FC/PC with Narrow key
Polarization Ratio (dB)	>50:1	>50:1	>50:1	>50:1
Polarization Orientation	Parallel or Perpendicular to the Key position.	Parallel or Perpendicular to the Key position.	Parallel or Perpendicular to the Key position.	Parallel or Perpendicular to the Key position.

*Other wavelengths are available.

**Output power is variable in CW mode from 10% to 100% of rated power. Specifications are valid for 100% power.

TABLE 2. MECHANICAL & ENVIRONMENTAL SPECIFICATION

STATIC ALIGNMENT TOLERANCES	ALL WAVELENGTHS
Static Alignment Tolerances	All Wavelengths
Beam Position from Reference (mm)	±0.5
Beam Angle (mrad)	±2.5
Beam Waist Position from Exit Window (mm)	±200
Dimensions (L x W x H) (mm)*	86x40x44
Power Consumption (W)	≤12
Laser Head Baseplate Temperature (Max. °C)	40
Heat Dissipation of Laser Head (W)	≤12
Operating Temperature (°C)	10 to 40
Storage Temperature (°C)	-20 to 60
Humidity (%) (Non-condensing)	10 to 90
Shock (11ms duration) (Operating) (g)	1
Shock (11ms duration) (Non-operating) (g)	30
Vibration (5Hz – 500Hz) (Operating) (g)	0.3
Vibration (5Hz – 500Hz) (Non-operating) (g)	3
Laser Safety Classification	3b

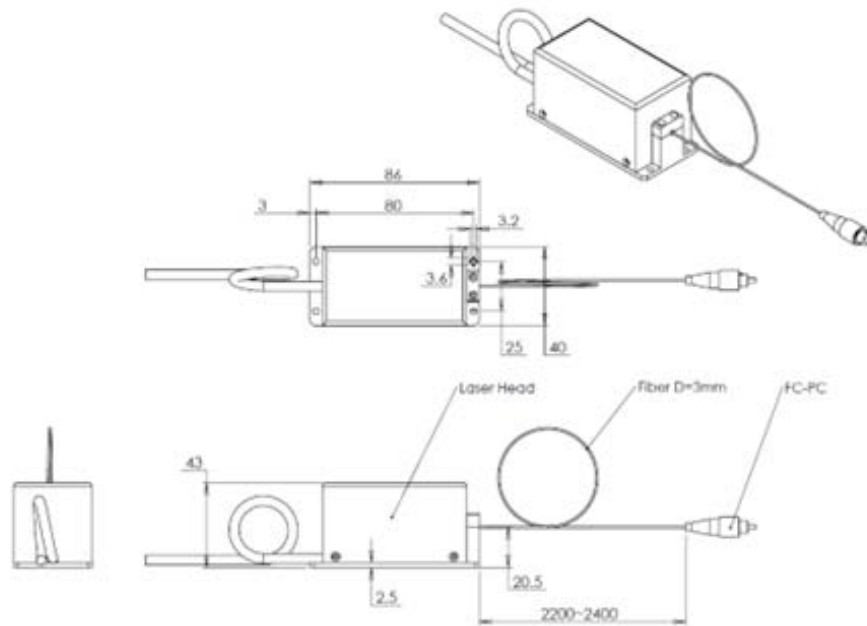
Note: * 561nm: 100x43.2x40mm

TABLE 3. Electrical Specifications

DB9 Connector PIN Assignment	Digital Interface	Analog Interface
1*	LD_5V or 9V or 12V	LD_5V or 9V or 12V
2	Rx for RS232	NC
3	TEC_5V	TEC_5V
4	Tx for RS232	NC
5	TEC_GND	TEC_GND
6	NC	ADJ
7	NC	Enable
8	GND for RS232	NC
9	LD_GND	LD_GND

*405/488/505/515nm LD driving voltage: 9V or 12V ;532/561/638/785nm LD driving voltage: 5V

MECHANICAL SPECIFICATIONS



ORDER CODE

WhisperIT®

Package Type (e.g. W) _____

Wavelength (e.g. 488nm = 488) _____

Output Power (e.g. 10mW = 10) _____

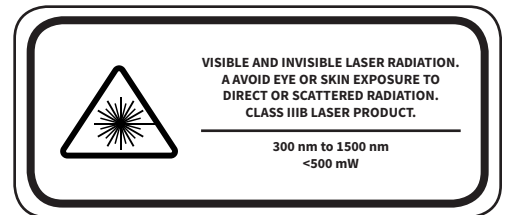
Delivery (e.g. Free Space = FS, Fiber Coupled = FC) _____

Assigned Code (e.g. 000) _____

EXAMPLE: W488-10FC-000

This OEM laser does not comply with 21 CFR 1040.10 and 1040.11 without appropriate integration. Please contact Pavilion Integration Corp. for additional support or questions.

ISO9001 & ISO13485 Registered



Mini-WhisperIT® WMN Laser Modules

Miniaturized Package – Free Space

Mini-WhisperIT® WMN-series laser modules are diode-based continuous-wave lasers in an ultra-compact package offering significantly increased lifetime, and improved efficiency over DPSS, HeCd or Argon lasers.

The proprietary WhisperIT® technology eliminates mode hops and delivers with extremely low optical noise. WhisperIT® WMN lasers include patented integrated driver electronics for highly stable, low coherence and low speckle operation guarantees outstanding performance over time and temperature.

The WhisperIT® WMN-series lasers are available with round or customized beam shape that are tailored to match specific application requirements.

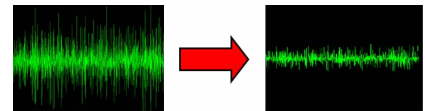


FEATURES

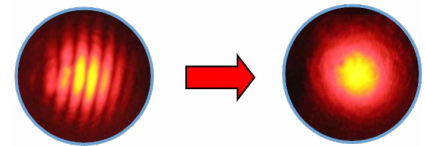
- » Miniaturized Size
- » Ultra-low Noise
- » Low Coherence
- » Mode-Hop Free
- » Extremely Stable
- » Integrated Control Electronics

APPLICATIONS

- » Flow Cytometry
- » DNA Sequencing
- » Medical Imaging
- » Confocal Microscopy
- » Metrology
- » Semiconductor Instrumentation



Low Noise



Low Coherence

TABLE 1. OPTICAL SPECIFICATION

SPECIFICATIONS	WMN405	WMN488	WMN505	WMN515
Wavelength (nm)*	375±5	405±5	488±5	505±5
Output Power (mW)**	20,50,80,100, 150,200,250	20,50,80,100, 150,200,250	20,50,80,100, 150,200,250	20, 50, 80, 100
RMS Noise (20Hz to 20 MHz) (%)	≤0.1	≤0.1	≤0.1	≤0.1
Peak to Peak Noise (20Hz to 20kHz) (%)	<0.5	<0.5	<0.5	<0.5
Long-Term Power Stability (8hrs, ±3°C) (%)	<1	<1	<1	<1
Spatial Mode (TEM00) M ²	≤1.2	≤1.2	≤1.2	≤1.2
Beam Diameter at 1/e ² (mm) (Typ.)@150mm	0.9*1.7	0.9*1.75	0.75*2.9	0.7*1.75
Beam Divergence Angle (mrad, full angle)	≤1.2	≤1.2	≤1.2	≤1.2
Pointing Stability (μrad)	3mm or 0.9mm cable	3mm or 0.9mm cable	3mm or 0.9mm cable	3mm or 0.9mm cable
(over 2 hours after warm up and ±3°C)	<30	<30	<30	<30
Pointing Stability Over Temperature (μrad/°C)	<5	<5	<5	<5
Warm-up Time (from cold start) (minutes)	<5	<5	<5	<5
Polarization Ratio	>100:1	>100:1	>100:1	>100:1
Polarization Direction	Vertical ±5°	Vertical ±5°	Vertical ±5°	Vertical ±5°

SPECIFICATIONS	WMN532	WMN553/561	WMN638	WMN785
Wavelength (nm)*	520±5	532±5	638±5	730±5
Output Power (mW)	20,50,80,100	20,50,80,100	20, 50, 80, 100	20, 40
RMS Noise (20Hz to 20 MHz) (%)	≤0.2	≤0.2	≤0.1	≤0.1
Peak to Peak Noise (20Hz to 20kHz) (%)	<0.5	<0.5	<0.5	<0.5
Long-Term Power Stability (8hrs, ±3°C) (%)	<1	<1	<1	<1
Spatial Mode (TEM00) M ²	≤1.2	≤1.2	≤1.2	≤1.2
Beam Symmetry	≤1:1.1	≤1:1.1	NA	NA
Beam Diameter at 1/e ² (mm)	0.85*2.9	0.7±0.1	0.8*1.5	0.75*1.5
Beam Divergence Angle (mrad, full angle)	<1	<1	<1.2	<1.3
Pointing Stability (μrad)	<30	<30	<30	<30
(over 2 hours after warming up and ±3°C)	<30	<30	<30	<30
Pointing Stability Over Temperature (μrad/°C)	<5	<5	<5	<5
Warm-up Time (from cold start) (minutes)	<5	<5	<5	<5
Polarization Ratio	>100:1	>100:1	>100:1	>100:1
Polarization Direction	Vertical ±5°	Vertical ±5°	Vertical ±5°	Vertical ±5°

*Other wavelengths available upon request.

**Output power is variable in CW mode from 10% to 100% of rated power. Specifications are valid for 100% power.

TABLE 2. MECHANICAL & ENVIRONMENTAL SPECIFICATION

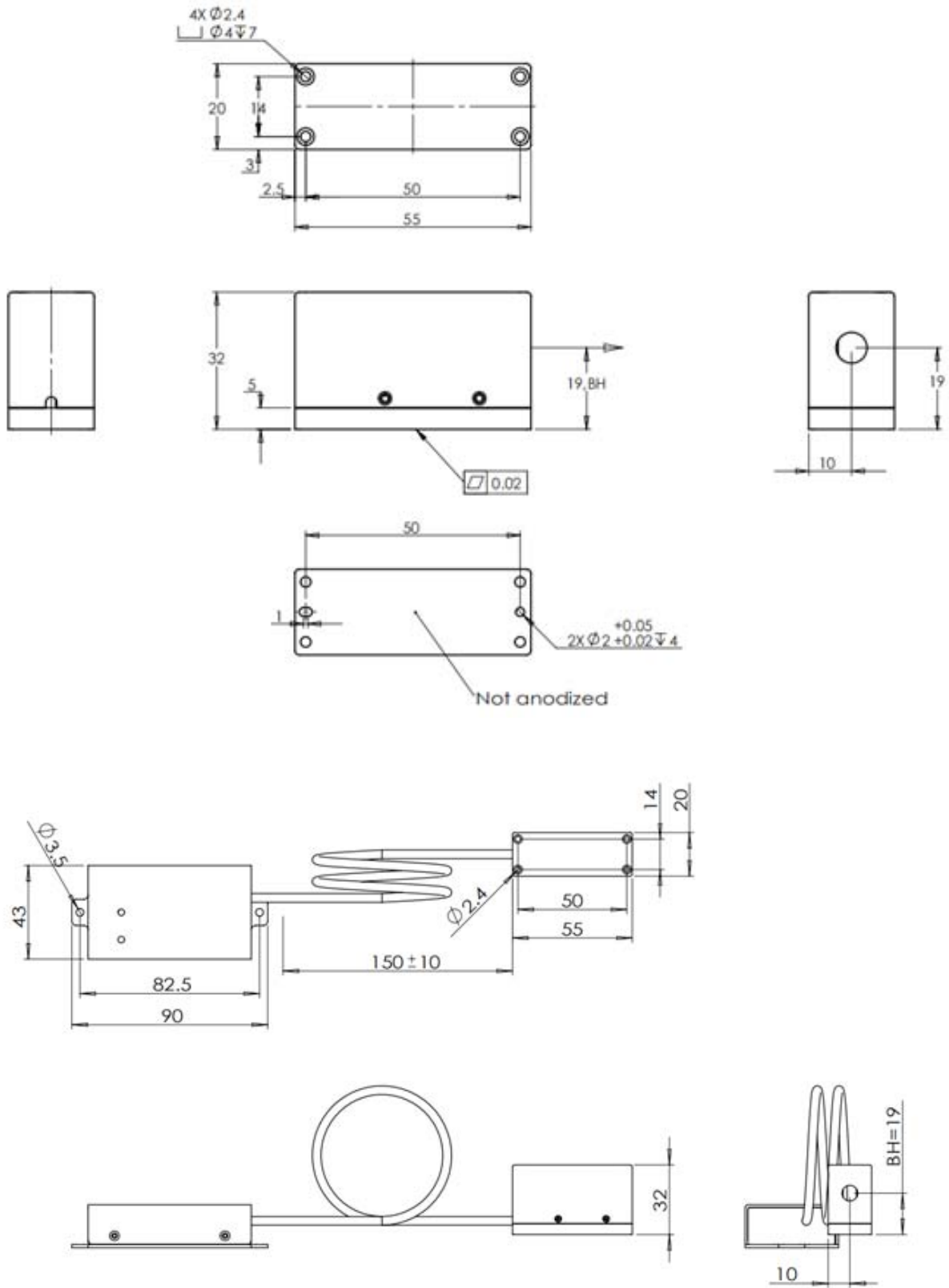
STATIC ALIGNMENT TOLERANCES	ALL WAVELENGTHS
Static Alignment Tolerances	All Wavelengths
Beam Position from Reference (mm)	±0.5
Beam Angle (mrad)	±2.5
Beam Waist Position from Exit Window (mm)	±200
Dimensions (L x W x H) (mm)	55 x 20 x 32
Power Consumption (W)	≤12
Laser Head Baseplate Temperature (Max. °C)	40
Heat Dissipation of Laser Head (W)	≤12
Operating Temperature (°C)	10 to 40
Storage Temperature (°C)	-20 to 60
Humidity (%)	10 to 90
Shock (11ms duration) (Operating) (g)	1
Shock (11ms duration) (Non-operating) (g)	30
Vibration (5Hz – 500Hz) (Operating) (g)	0.3
Vibration (5Hz – 500Hz) (Non-operating) (g)	3
Laser Safety Classification	3b

TABLE 3. Electrical Specifications

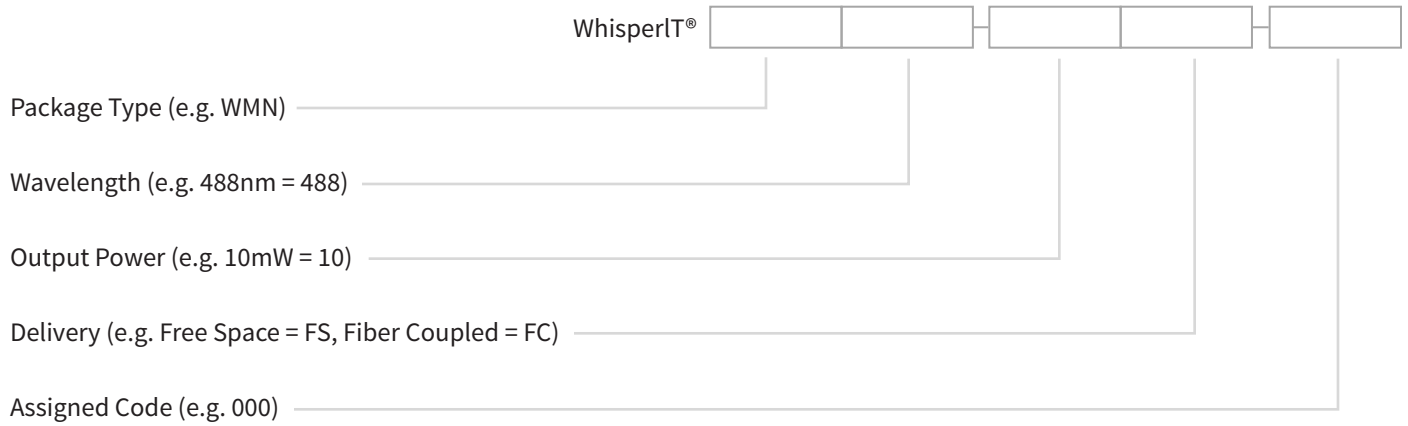
DB9 Connector PIN Assignment	Digital Interface	Analog Interface
1*	LD_5V or 9V or 12V	LD_5V or 9V or 12V
2	Rx for RS232	NC
3	TEC_5V	TEC_5V
4	Tx for RS232	NC
5	TEC_GND	TEC_GND
6	NC	ADJ
7	NC	Enable
8	GND for RS232	NC
9	LD_GND	LD_GND

*405/488/505/515nm LD driving voltage: 9V or 12V ;532/561/638/785nm LD driving voltage: 5V

MECHANICAL SPECIFICATIONS



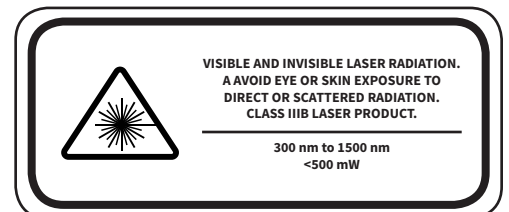
ORDER CODE



EXAMPLE: WMN488-10FS-000

This OEM laser does not comply with 21 CFR 1040.10 and 1040.11 without appropriate integration. Please contact Pavilion Integration Corp. for additional support or questions.

ISO9001 & ISO13485 Registered



WhisperIT®

Whisper Compact Package – Free Space (WCP-FS series)

WhisperIT® WCP-FS Series Compact Lasers are laser diode-based continuous-wave solid-state lasers that offer significantly increased lifetime, and improved efficiency over DPSS, HeCd or Argon lasers. The proprietary WhisperIT® technology eliminates mode hops and delivers lasers with extremely low optical noise.

WhisperIT® WCP-FS lasers with integrated patented driver electronics for highly stable, low coherence and low speckle operation guarantees outstanding performance over time and temperature.

The WhisperIT® WCP-FS series lasers are available with round or customized beam shape that are tailored to match specific application requirements.

FEATURES

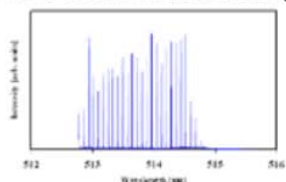
- » Ultra-Low Noise
- » Low Coherence
- » Mode-hop Free
- » Integrated Control Electronics
- » Digital, Analog Modulation

APPLICATIONS

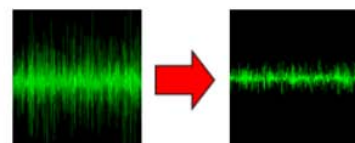
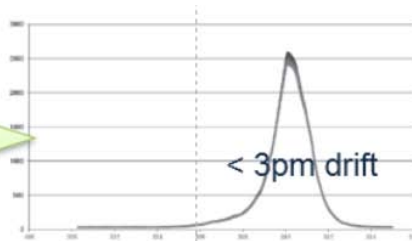
- » Flow Cytometry
- » DNA Sequencing
- » Medical Imaging
- » Confocal Microscopy
- » Optogenetics
- » Metrology
- » Semiconductor Instrumentation



Laser diode and mode hop



Whisper IT®



Low Noise

TABLE 1. OPTICAL SPECIFICATION

SPECIFICATIONS	WCP405	WCP488	WCP505	WCP515
Wavelength (nm)*	405±5	488±5	505±5	515±5
Output Power (mW)**	20,50,80, 100,150,200,250	20,50,80, 100,150,200	20,50,80	20,50,80, 100,150
RMS Noise (20Hz to 20 MHz) (%)	≤0.1	≤0.1	≤0.1	≤0.1
Peak to Peak Noise (20Hz to 20kHz) (%)	<0.5	<0.5	<0.5	<0.5
Long-Term Power Stability (8hrs, ±3°C) (%)	<2	<2	<2	<2
Spatial Mode (TEM00) M2	≤1.2	≤1.2	≤1.2	≤1.2
Beam Symmetry	≤1:1.1	≤1:1.1	≤1:1.1	≤1:1.1
Beam Diameter at 1/e2 (mm) @150mm	0.85±0.1	0.7±0.1	0.7±0.1	0.7±0.1
Beam Divergence Angle (mrad, full angle)	<1.2	<1.2	<1.2	<1.2
Pointing Stability (μrad) (over 2 hours after warm up and ±3°C)	<30	<30	<30	<30
Pointing Stability Over Temperature (μrad/°C)	<5	<5	<5	<5
Warm-up Time (from cold start) (minutes)	<5	<5	<5	<5
Polarization Ratio	>100:1	>100:1	>100:1	> 100:1
Polarization Direction	Vertical ±5°	Vertical ±5°	Vertical ±5°	Vertical ±5°

SPECIFICATIONS	WCP532	WCP553/561	WCP638	WCP785
Wavelength (nm)*	532±5	553/561±3	638±5	785±5
Output Power (mW)**	20,50,80,100	20,50,80,100,150	20,50,80,100,150	20,50,80,100
RMS Noise (20Hz to 20 MHz) (%)	≤0.25	≤0.25	≤0.1	≤0.1
Peak to Peak Noise (20Hz to 20kHz) (%)	<1	<1	<0.5	<0.5
Long-Term Power Stability (8hrs, ±3°C) (%)	<2	<2	<2	<2
Spatial Mode (TEM00) M2	≤1.1	<1.2	≤1.2	≤1.2
Beam Symmetry	≤1:1.1	≤1:1.1	≤1:1.1	≤1:1.1
Beam Diameter at 1/e2 (mm) @150mm	0.7±0.1	0.7±0.1	0.7±0.1	0.75±0.1
Beam Divergence Angle (mrad, full angle)	<1.2	<1.2	<1.4	<1.7
Pointing Stability (μrad) (over 2 hours after warm up and ±3°C)	<30	<30	<30	<30
Pointing Stability Over Temperature (μrad/°C)	<5	<5	<5	<5
Warm-up Time (from cold start) (minutes)	<5	<5	<5	<5
Polarization Ratio	>100:1	>100:1	>100:1	> 100:1
Polarization Direction	Vertical ±5°	Vertical ±5°	Vertical ±5°	Vertical ±5°

*Other wavelengths are available

**Output power is variable in CW mode from 10% to 100% of rated power. Specifications are valid for 100% power.

TABLE 2. MECHANICAL & ENVIRONMENTAL SPECIFICATION

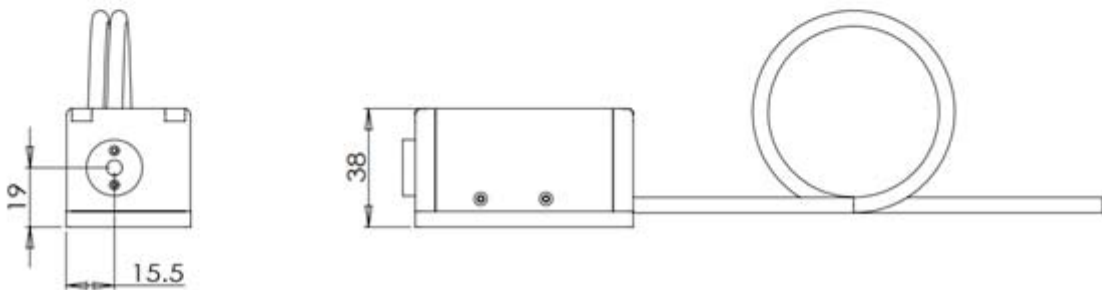
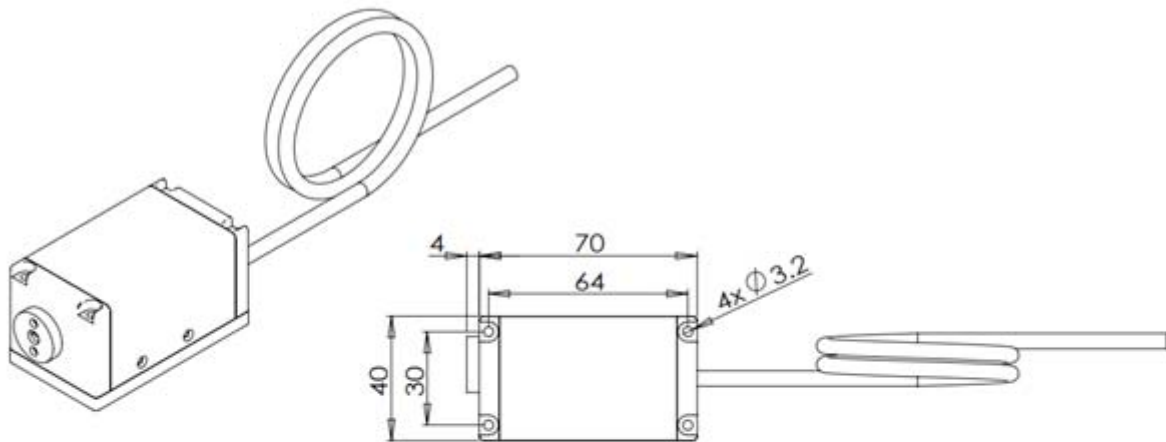
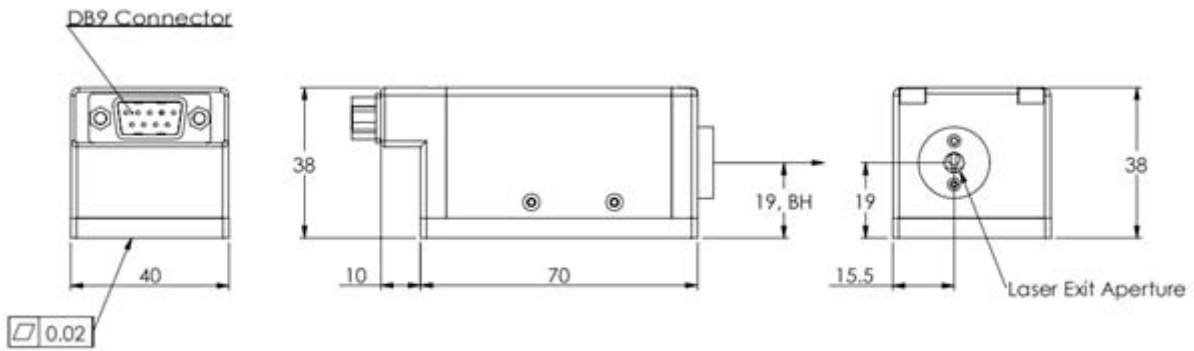
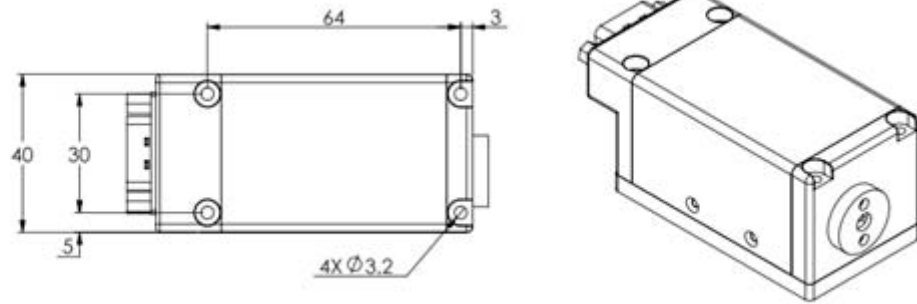
STATIC ALIGNMENT TOLERANCES	ALL WAVELENGTHS
Beam Position from Reference (mm)	±0.5
Beam Angle (mrad)	±2.5
Beam Waist Position from Exit Window (mm)	±200
Dimensions (L x W x H) (mm)	70 (80) x 40 x 38
Power Consumption (W)	≤12
Laser Head Baseplate Temperature (Max. °C)	40
Heat Dissipation of Laser Head (W)	≤12
Operating Temperature (°C)	10 to 50
Storage Temperature (°C)	-20 to 60
Humidity (%)	10 to 90
Shock (11ms duration) (Operating) (g)	1
Shock (11ms duration) (Non-operating) (g)	30
Vibration (5Hz – 500Hz) (Operating) (g)	0.3
Vibration (5Hz – 500Hz) (Non-operating) (g)	3
Laser Safety Classification	3b

TABLE 3. Electrical Specifications

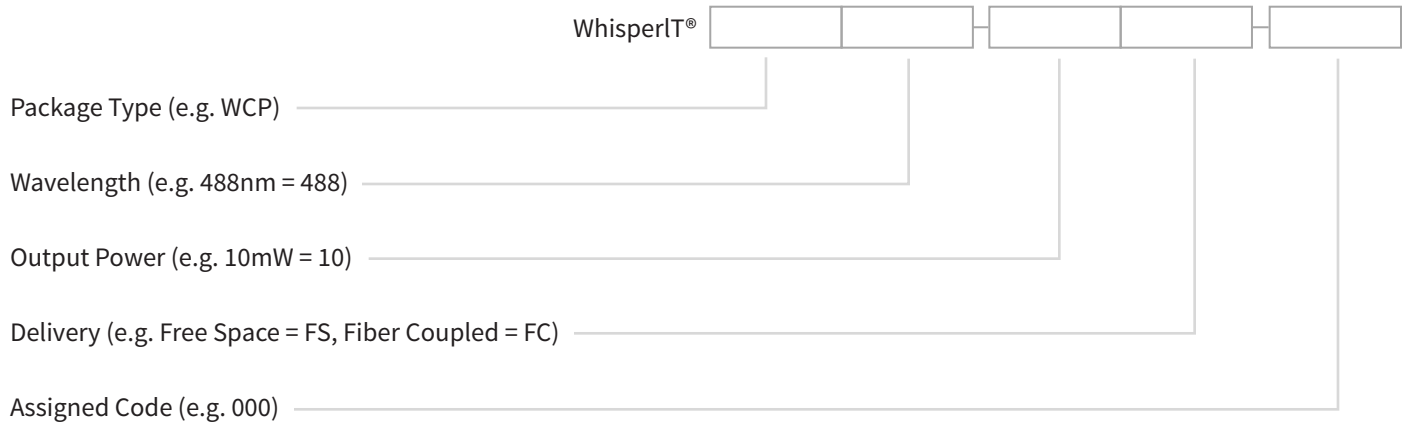
DB9 Connector PIN Assignment	Digital Interface	Analog Interface
1*	LD_5V or 9V or 12V	LD_5V or 9V or 12V
2	Rx for RS232	NC
3	TEC_5V	TEC_5V
4	Tx for RS232	NC
5	TEC_GND	TEC_GND
6	NC	ADJ
7	NC	Enable
8	GND for RS232	NC
9	LD_GND	LD_GND

*405/488/505/515nm LD driving voltage: 9V or 12V; 532/561/638/785nm LD driving voltage: 5V

MECHANICAL SPECIFICATIONS



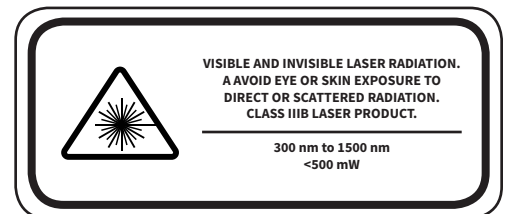
ORDER CODE



EXAMPLE: WCP488-20FS-000

This OEM laser does not comply with 21 CFR 1040.10 and 1040.11 without appropriate integration. Please contact Pavilion Integration Corp. for additional support or questions.

ISO9001 & ISO13485 Registered



WhisperIT®

Whisper Compact Package – Fiber Coupled (WCP-FC series)

WhisperIT® WCP-FC Series Compact Lasers offer an excellent signal-to-noise ratio. Low coherence leads to a reduction of laser speckle and the elimination of diffraction patterns. High reliability & consistent performance enables demanding biomedical and scientific instrumentation applications.

WhisperIT® WCP-FC Series Compact Lasers are laser diode-based continuous-wave solid-state lasers that offer significantly increased lifetime, and improved efficiency over DPSS, HeCd or Argon lasers. The proprietary WhisperIT® technology eliminates mode hops and delivers lasers with extremely low optical noise.

WhisperIT® Lasers with integrated patented driver electronics for highly stable, low coherence and low speckle operation guarantees outstanding performance over time and temperature.

The WhisperIT® WCP-FC series lasers are tailored to match specific application requirements.

FEATURES

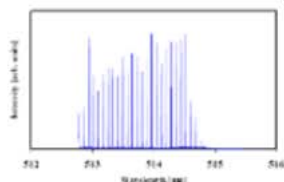
- » Ultra-Low Noise
- » Low Coherence
- » Mode-hop Free
- » Integrated Control Electronics
- » Digital, Analog or Custom Modulation

APPLICATIONS

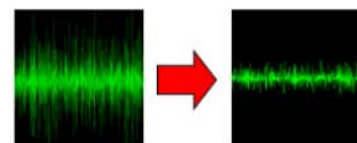
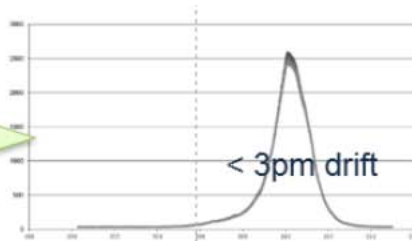
- » Flow Cytometry
- » DNA Sequencing
- » Medical Imaging
- » Confocal Microscopy
- » Optogenetics
- » Metrology
- » Semiconductor Instrumentation



Laser diode and mode hop



Whisper IT®



Low Noise

TABLE 1. OPTICAL SPECIFICATION

SPECIFICATIONS	WCP405	WCP488	WCP505	WCP515
Wavelength (nm)*	405±5	488±5	505±5	515±5
Output Power (mW)**	20,50,80,100, 150	20,50,80,100, 150	20,50	20,50,80,100
RMS Noise (20Hz to 20 MHz) (%)	≤0.2	≤0.2	≤0.2	≤0.25
Peak to Peak Noise (20Hz to 20kHz) (%)	<2	<2	<2	<2
Long-Term Power Stability (8hrs, ±3°C) (%)	<2	<2	<2	<2
Spatial Mode (TEM00) M2	≤1.1	≤1.1	≤1.1	≤1.1
Beam Symmetry	≤1:1.1	≤1:1.1	≤1:1.1	≤1:1.1
Warm-up Time (from cold start) (minutes)	<5	<5	<5	<5
Fiber Jacket	3mm	3mm	3mm	3mm
Fiber Length (m)	1	1	1	1
Connector Type	FC/APC	FC/APC	FC/APC	FC/APC
Polarization Ratio	>100:1	>100:1	>100:1	>100:1
Polarization Direction	Perpendicular to connector key	Perpendicular to connector key	Perpendicular to connector key	Perpendicular to connector key
Polarization Direction	Vertical ±5°	Vertical ±5°	Vertical ±5°	Vertical ±5°

SPECIFICATIONS	WCP532	WCP553/561	WCP638	WCP785
Wavelength (nm)*	532±5	561±3	638±5	785±5
Output Power (mW)**	20,50,80	20,50,80	20,50,80,100	20,50,80,100
RMS Noise (20Hz to 20 MHz) (%)	≤0.25	≤0.25	≤0.2	≤0.2
Peak to Peak Noise (20Hz to 20kHz) (%)	<1	<1	<2	<2
Long-Term Power Stability (8hrs, ±3°C) (%)	<2	<2	<2	<2
Spatial Mode (TEM00) M2	≤1.1	≤1.1	≤1.1	≤1.1
Beam Symmetry	≤1:1.1	≤1:1.1	≤1:1.1	≤1:1.1
Warm-up Time (from cold start) (minutes)	<5	<5	<5	<5
Fiber Jacket	3mm	3mm	3mm	3mm
Fiber Length (m)	1	1	1	1
Connector Type	FC/APC	FC/APC	FC/APC	FC/APC
Polarization Ratio	>100:1	>100:1	>100:1	>100:1
Polarization Direction	Perpendicular to connector key	Perpendicular to connector key	Perpendicular to connector key	Perpendicular to connector key

*Other wavelengths are available

**Output power is variable in CW mode from 10% to 100% of rated power. Specifications are valid for 100% power.

TABLE 2. MECHANICAL & ENVIRONMENTAL SPECIFICATION

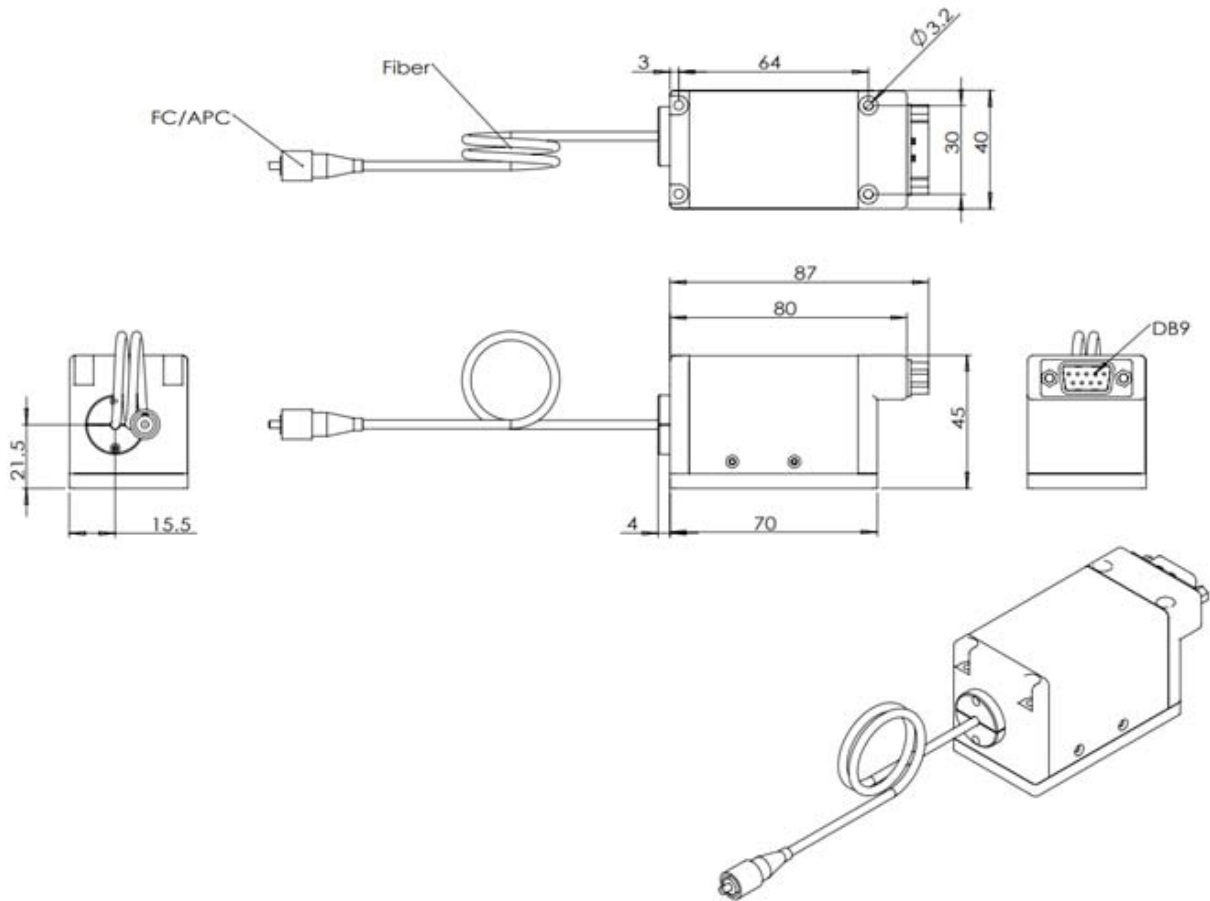
STATIC ALIGNMENT TOLERANCES	ALL WAVELENGTHS
Dimensions (L x W x H) (mm)	70 x 40 x 45
Power Consumption (W)	≤12
Laser Head Baseplate Temperature (Max. °C)	40
Heat Dissipation of Laser Head (W)	≤12
Operating Temperature (°C)	10 to 50
Storage Temperature (°C)	-20 to 60
Humidity (%)	10 to 90
Shock (11ms duration) (Operating) (g)	1
Shock (11ms duration) (Non-operating) (g)	30
Vibration (5Hz – 500Hz) (Operating) (g)	0.3
Vibration (5Hz – 500Hz) (Non-operating) (g)	3
Laser Safety Classification	3b
Vibration (5Hz – 500Hz) (Operating) (g)	0.3
Vibration (5Hz – 500Hz) (Non-operating) (g)	3
Laser Safety Classification	3b

TABLE 3. Electrical Specifications

DB9 Connector PIN Assignment	Digital Interface	Analog Interface
1*	LD_5V or 9V or 12V	LD_5V or 9V or 12V
2	Rx for RS232	NC
3	TEC_5V	TEC_5V
4	Tx for RS232	NC
5	TEC_GND	TEC_GND
6	NC	ADJ
7	NC	Enable
8	GND for RS232	NC
9	LD_GND	LD_GND

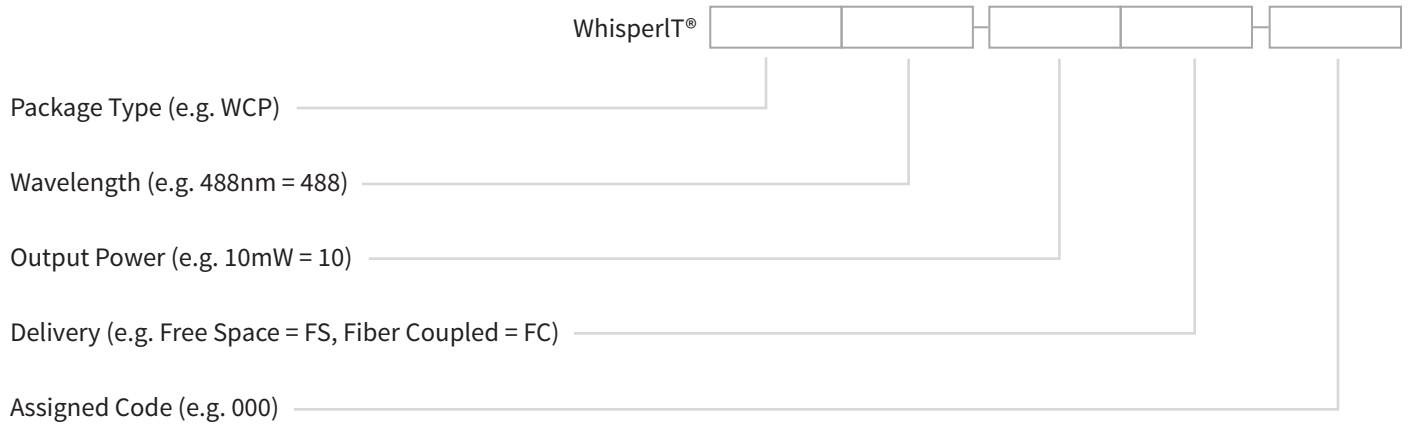
*405/488/505/515nm LD driving voltage: 9V or 12V; 532/561/638/785nm LD driving voltage: 5V

MECHANICAL SPECIFICATIONS



Please contact PIC for other connector or collimation options.

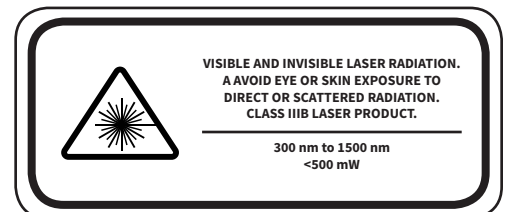
ORDER CODE



EXAMPLE: WCP488-10FC-000

This OEM laser does not comply with 21 CFR 1040.10 and 1040.11 without appropriate integration. Please contact Pavilion Integration Corp. for additional support or questions.

ISO9001 & ISO13485 Registered



WhisperIT[®]

Standard Laser (WSL-FS series)

WhisperIT[®] WSL-FS series lasers offer robust packaging for higher power operation. Excellent signal-to-noise and low coherence leads to a reduction of laser speckle and the elimination of diffraction patterns. High reliability & consistent performance enables demanding biomedical and scientific instrumentation applications.

WhisperIT[®] WSL-FS series lasers are laser diode-based continuous-wave solid-state lasers that offer significantly increased lifetime, and improved efficiency over DPSS, HeCd or Argon lasers. The proprietary WhisperIT[®] technology eliminates mode hops and delivers lasers with extremely low optical noise.

WhisperIT[®] WSL-FS series lasers with integrated patented driver electronics for highly stable, low coherence and low speckle operation guarantees outstanding performance over time and temperature.

The WhisperIT[®] WSL-FS series lasers are available with round or customize beam shape that are tailored to match specific application requirements.

FEATURES

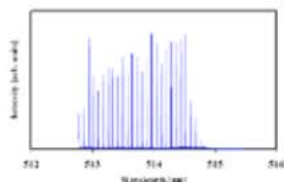
- » Ultra-Low Noise
- » Low Coherence
- » Mode-hop Free
- » Integrated Control Electronics
- » Digital, Analog Modulation

APPLICATIONS

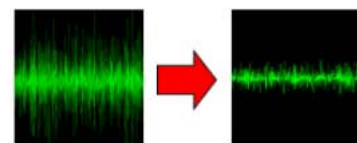
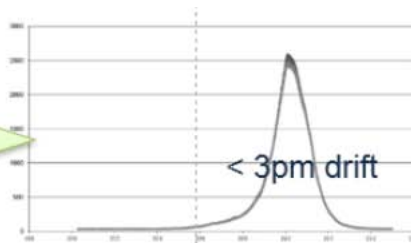
- » Flow Cytometry
- » DNA Sequencing
- » Medical Imaging
- » Confocal Microscopy
- » Optogenetics
- » Metrology
- » Semiconductor Instrumentation



Laser diode and mode hop



Whisper IT[®]



Low Noise

TABLE 1. OPTICAL SPECIFICATION

SPECIFICATIONS	WSL405	WSL488	WSL505	WSL515
Wavelength (nm)*	405±5	488±5	505±5	515±5
Output Power (mW)**	20,50,80, 100,150,200,250	20,50,80, 100,150,200	20,50,80	20,50,80, 100,150
RMS Noise (20Hz to 2 MHz) (%)	≤0.1	≤0.1	≤0.1	≤0.1
Peak to Peak Noise (20Hz to 20kHz) (%)	<0.5	<0.5	<0.5	<0.5
Long-Term Power Stability (2hrs, ±3°C) (%)	<2	<2	<2	<2
Spatial Mode (TEM00) M2	≤1.2	≤1.2	≤1.2	≤1.2
Beam Symmetry	≤1:1.1	≤1:1.1	≤1:1.1	≤1:1.1
Beam Diameter at 1/e2 (mm)@50mm	0.85±0.1	0.7±0.1	0.7±0.1	0.75±0.1
Beam Divergence Angle (mrad, full angle)	<1.2	<1.2	<1.2	<1.2
Pointing Stability (μrad)	<30	<30	<30	<30
(over 2 hours after warm up and ±3°C)	<30	<30	<30	<30
Pointing Stability Over Temperature (μrad/°C)	<5	<5	<5	<5
Warm-up Time (from cold start) (minutes)	<5	<5	<5	<5
Polarization Ratio	>100:1	>100:1	>100:1	>100:1
Polarization Direction	Vertical ±5°	Vertical ±5°	Vertical ±5°	Vertical ±5°

SPECIFICATIONS	WSL532	WSL553/561	WSL638	WSL785
Wavelength (nm)*	532±5	553/561±3	638±5	785±5
Output Power (mW)**	20,50,80,100	20,50,100,200	20,50,80,100,150	20,50,80,100
RMS Noise (20Hz to 2 MHz) (%)	≤0.25	≤0.25	≤0.1	≤0.1
Peak to Peak Noise (20Hz to 20kHz) (%)	<1	<1	<0.5	<0.5
Long-Term Power Stability (2hrs, ±3°C) (%)	<2	<2	<2	<2
Spatial Mode (TEM00) M2	≤1.1	≤1.1	≤1.2	≤1.2
Beam Symmetry	≤1:1.1	≤1:1.1	≤1:1.1	≤1:1.1
Beam Diameter at 1/e2 (mm) @50mm	0.7±0.1	0.7±0.1	0.7±0.1	0.75±0.1
Beam Divergence Angle (mrad, full angle)	<1.2	<1.2	<1.3	<1.7
Pointing Stability (μrad)	<30	<30	<30	<30
(over 2 hours after warm up and ±3°C)	<30	<30	<30	<30
Pointing Stability Over Temperature (μrad/°C)	<5	<5	<5	<5
Warm-up Time (from cold start) (minutes)	<5	<5	<5	<5
Polarization Ratio	>100:1	>100:1	>100:1	>100:1
Polarization Direction	Vertical ±5°	Vertical ±5°	Vertical ±5°	Vertical ±5°

*Other wavelengths are available

**Output power is variable in CW mode from 10% to 100% of rated power. Specifications are valid for 100% power.

TABLE 2. MECHANICAL & ENVIRONMENTAL SPECIFICATION

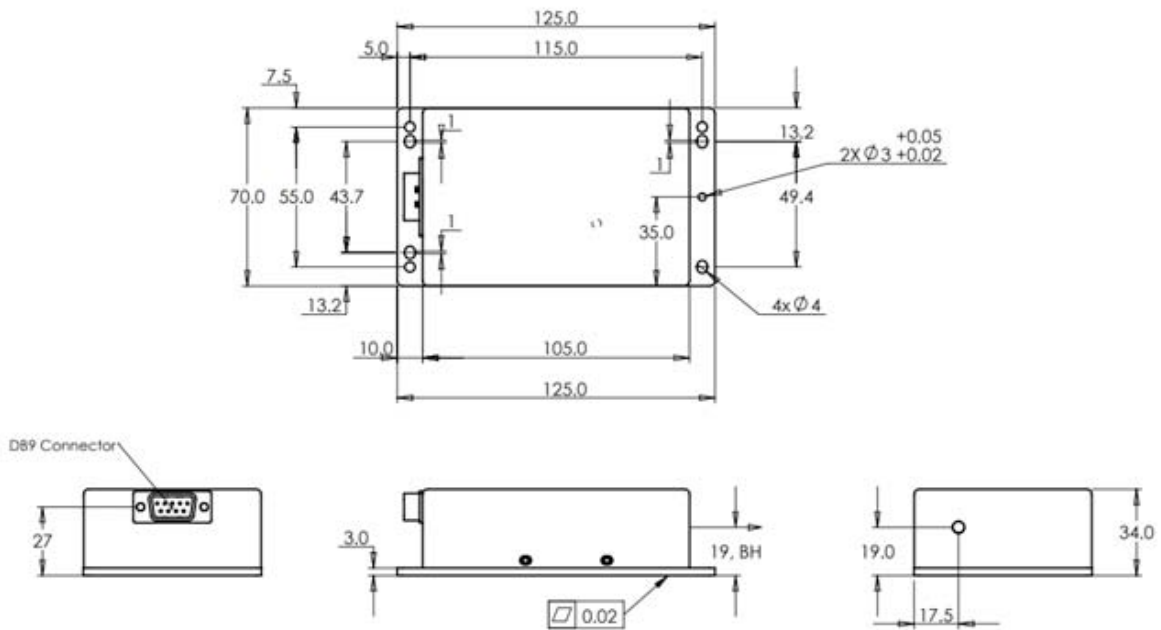
STATIC ALIGNMENT TOLERANCES	ALL WAVELENGTHS
Static Alignment Tolerances	All Wavelengths
Beam Position from Reference (mm)	±0.5
Beam Angle (mrad)	±2.5
Beam Waist Position from Exit Window (mm)	±200
Dimensions (L x W x H) (mm)	125 x 70 x 34
Power Consumption (W)	≤12
Laser Head Baseplate Temperature (Max. °C)	40
Heat Dissipation of Laser Head (W)	≤12
Operating Temperature (°C)	10 to 50
Storage Temperature (°C)	-20 to 60
Humidity (%)	10 to 90
Shock (11ms duration) (Operating) (g)	1
Shock (11ms duration) (Non-operating) (g)	30
Vibration (5Hz – 500Hz) (Operating) (g)	0.3
Vibration (5Hz – 500Hz) (Non-operating) (g)	3
Laser Safety Classification	3b

TABLE 3. Electrical Specifications

DB9 Connector PIN Assignment	Digital Interface	Analog Interface
1*	LD_5V or 9V or 12V	LD_5V or 9V or 12V
2	Rx for RS232	NC
3	TEC_5V	TEC_5V
4	Tx for RS232	NC
5	TEC_GND	TEC_GND
6	NC	ADJ
7	NC	Enable
8	GND for RS232	NC
9	LD_GND	LD_GND

*405/488/505/515nm LD driving voltage: 9V or 12V; 532/561/638/785nm LD driving voltage: 5V

MECHANICAL SPECIFICATIONS



ORDER CODE

WhisperIT®

Package Type (e.g. WSL) _____

Wavelength (e.g. 488nm = 488) _____

Output Power (e.g. 10mW = 10) _____

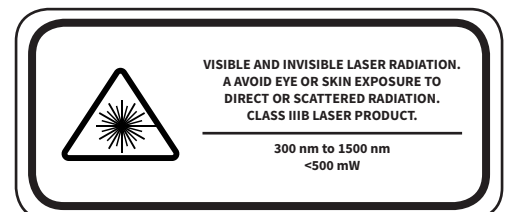
Delivery (e.g. Free Space = FS, Fiber Coupled = FC) _____

Assigned Code (e.g. 000) _____

EXAMPLE: WSL488-20FS-000

This OEM laser does not comply with 21 CFR 1040.10 and 1040.11 without appropriate integration. Please contact Pavilion Integration Corp. for additional support or questions.

ISO9001 & ISO13485 Registered



WhisperIT[®]

Whisper Sapphire Round – Fiber coupled with a Collimator (WSR488-FCO series)

The WhisperIT[®] WSR488 laser with PM fiber coupled, collimated output, featuring true gaussian beam, PIC patented technology for low noise, mode-hop free, back reflection protection and stable power operation, and with digital or analog interface and standard firmware.

WhisperIT[®] WSR488 are laser diode-based continuous-wave solid-state lasers that offer significantly increased lifetime, guarantees outstanding performance over time and temperature. The proprietary WhisperIT[®] technology eliminates mode hops and delivers lasers with extremely low optical noise.

WhisperIT[®] WSR488 lasers enable demanding biomedical and scientific instrumentation applications.

FEATURES

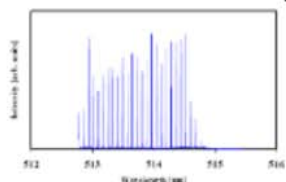
- » Ultra-Low Noise
- » Low Coherence
- » Mode-hop Free
- » Integrated Control Electronics
- » Digital, Analog Modulation

APPLICATIONS

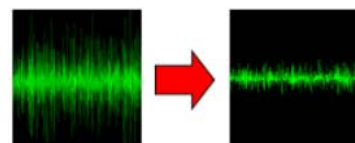
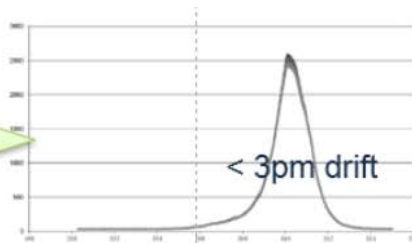
- » Flow Cytometry
- » DNA Sequencing
- » Medical Imaging
- » Confocal Microscopy
- » Optogenetics
- » Metrology
- » Semiconductor Instrumentation



Laser diode and mode hop



Whisper IT[®]



Low Noise

TABLE 1. Optical Specification

PARAMETER	Conditions	Min.	Specifications Typ.	Max.	UNITS
Wavelength	Max. Power	486	488	490	nm
Optical Output Power	CW Mode	20		100	mW
RMS Noise	20Hz-2MHz		0.15	0.2	%
Peak-to-Peak Noise	20Hz – 20kHz		0.5	1.0	%
Power Stability	8hrs, ±3°C, after 5 min warm-up	-1.0		1.0	%
Beam Diameter at 1/e2 (mm)			0.6 mm to 3 mm		
Beam Quality (M ²)	TEM ₀₀	1.0	1.05	1.1	
Beam Asymmetry1)		1.0	1.05	1.1	
Fiber Type			PMF		
Fiber Length			1.0+/- 0.1 m		

TABLE 2. Environment

PARAMETER	Conditions	Min.	Specifications Typ.	Max.	UNITS
Storage Temperature	Non-operation	-20		60	
Base Plate Temperature	Operating	15		45	°C
Base Plate Temperature	Non-operation	-20		60	°C
Humidity	Non-condensing	10		90	%
Shock (11ms duration)	Operating		1		g
Shock (11ms duration)	Non-operation		25		g
Vibration (5Hz – 500Hz)	Operation		0.3		g
Vibration (5Hz – 500Hz)	Non-operation		2		g

TABLE 3. Electrical

PARAMETER	Conditions	Min.	Specifications Typ.	Max.	UNITS
TEC Input Voltage		4.8	5	5.2	V
LD Input Voltage		4.8	9 (convertible)	5.2	V
TEC Current Consumption (5V)				1.5	A
LD Current Consumption (5V)				0.6	A
Heat Dissipation				11	W
Connector (laser head)	DB9	Male	Pin1: +9V (LD) Pin2: RS232_RXD Pin3: +5V (TEC) Pin4: RS232_TXD Pin5: GND for TEC Pin6: N/C Pin7: Laser Enable/Disable H (>2.7V): Enable L (<2.2V): Disable Floating: Disable Pin8: GND for RS232 Pin9: GND for LD		g
Communication Command			PIC00C2.5		

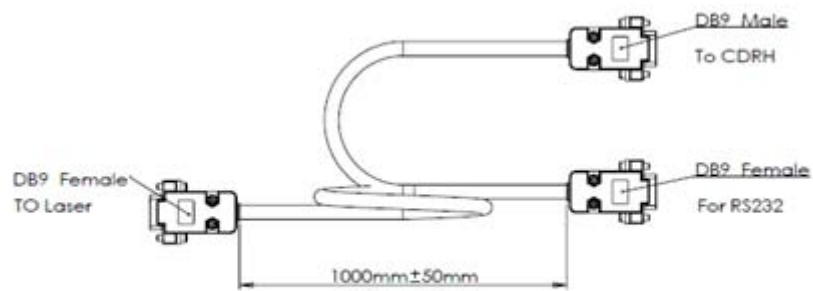
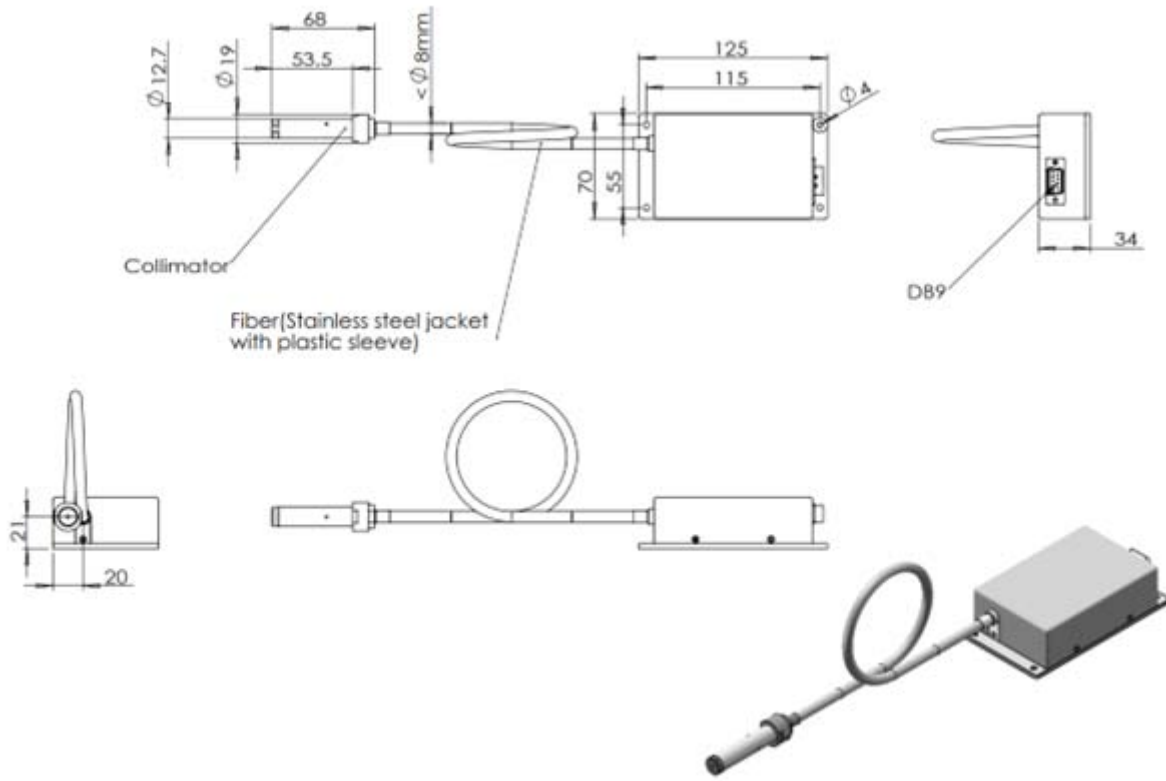
TABLE 4. Optional Electrical Interface

DB9 Connector PIN Assignment	Digital Interface	Analog Interface
1	LD_9V	LD_9V
2	Rx for RS232	NC
3	TEC_5V	TEC_5V
4	Tx for RS232	NC
5	TEC_GND	TEC_GND
6	NC	ADJ.
7	NC	Enable
8	GND for RS232	NC
9	LD_GND	LD_GND

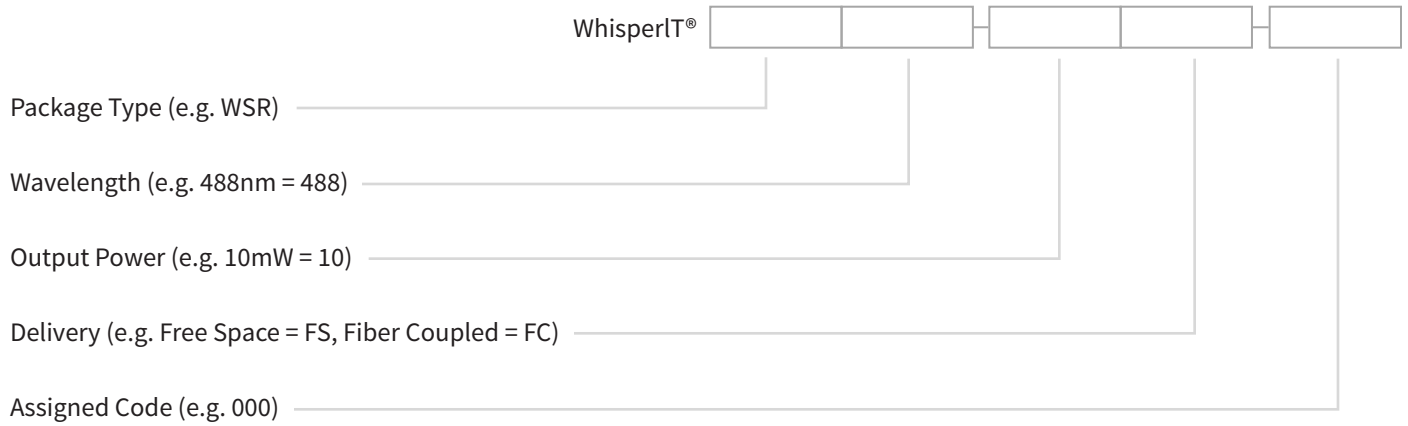
TABLE 5. Environment

PARAMETER	Conditions	Min.	Specifications Typ.	Max.	UNITS
Laser Head Dimension	L x W x H		125 × 70 × 34		mm
Laser Head Weight			400		g
Cable Length			1		m

MECHANICAL SPECIFICATIONS



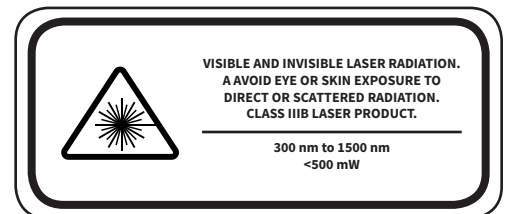
ORDER CODE



EXAMPLE: WSR488-20FCO-000

This OEM laser does not comply with 21 CFR 1040.10 and 1040.11 without appropriate integration. Please contact Pavilion Integration Corp. for additional support or questions.

ISO9001 & ISO13485 Registered



WhisperIT®

WhisperIT® SL – Fiber Coupled (WSR- FC series)

The WhisperIT® WSR488 laser with PM fiber coupled, FC/APC output connector, featuring true Gaussian beam, PIC patented technology for low noise, mode-hop free, back reflection protection and stable power operation, and with digital or analog interface and standard firmware.

WhisperIT® SL Lasers WSR488-FC are laser diode-based continuous-wave solid-state lasers that offer significantly increased lifetime, guarantees outstanding performance over time and temperature. The proprietary WhisperIT® technology eliminates mode hops and delivers lasers with extremely low optical noise.

WhisperIT® WSR488 lasers enable demanding biomedical and scientific instrumentation applications.

FEATURES

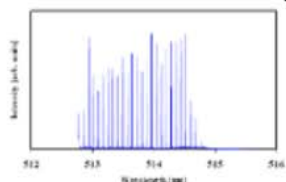
- » Ultra-Low Noise
- » Low Coherence
- » Mode-hop Free
- » Integrated Control Electronics
- » Digital, Analog Modulation

APPLICATIONS

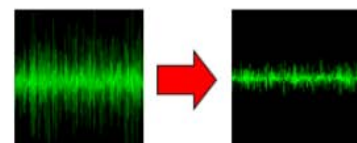
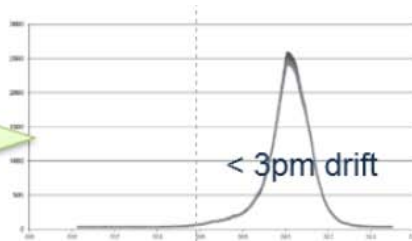
- » Flow Cytometry
- » DNA Sequencing
- » Medical Imaging
- » Confocal Microscopy
- » Optogenetics
- » Metrology
- » Semiconductor Instrumentation



Laser diode and mode hop



Whisper IT®



Low Noise

TABLE 1. Optical Specification

PARAMETER	Conditions	Min.	Specifications Typ.	Max.	UNITS
Wavelength	Max. Power	486	488	490	nm
Optical Output Power	CW Mode	20		100	mW
RMS Noise	20Hz-2MHz		0.15	0.2	%
Peak-to-Peak Noise	20Hz – 20kHz		0.5	1.0	%
Power Stability	8hrs, ±3°C, after 5 min warm-up	-1.0		1.0	%
Beam Quality (M ²)	TEM ₀₀	1.0	1.05	1.1	
Beam Asymmetry1)		1.0	1.05	1.1	
Fiber Core-to-Cladding Offset				0.5	µm
Fiber Coating Outer Diameter		230	245	260	µm
Fiber Cladding Outer Diameter		124	125	126	µm
Fiber Type			PMF		
Fiber Buffer Diameter			3mm		
Fiber Length			1.0+/- 0.1 m		
Fiber Output Connector Type			FC/APC		
Polarization Orientation			Paralleled to Connector Key		

TABLE 2. Environment

PARAMETER	Conditions	Min.	Specifications Typ.	Max.	UNITS
Storage Temperature	Non-operation	-20		60	
Base Plate Temperature	Operating	15		45	°C
Base Plate Temperature	Non-operation	-20		60	°C
Humidity	Non-condensing	10		90	%
Shock (11ms duration)	Operating		1		g
Shock (11ms duration)	Non-operation		25		g
Vibration (5Hz – 500Hz)	Operation		0.3		g
Vibration (5Hz – 500Hz)	Non-operation		2		g

TABLE 3. Electrical

PARAMETER	Conditions	Min.	Specifications Typ.	Max.	UNITS
TEC Input Voltage		4.8	5	5.2	V
LD Input Voltage		4.8	9 (convertible)	5.2	V
TEC Current Consumption (5V)				1.5	A
LD Current Consumption (5V)				0.6	A
Heat Dissipation				11	W
Connector (laser head)	DB9	Male	Pin1: +9V (LD) Pin2: RS232_RXD Pin3: +5V (TEC) Pin4: RS232_TXD Pin5: GND for TEC Pin6: N/C Pin7: Laser Enable/Disable H (>2.7V): Enable L (<2.2V): Disable Floating: Disable Pin8: GND for RS232 Pin9: GND for LD		g
Communication Command			PIC00C2.5		

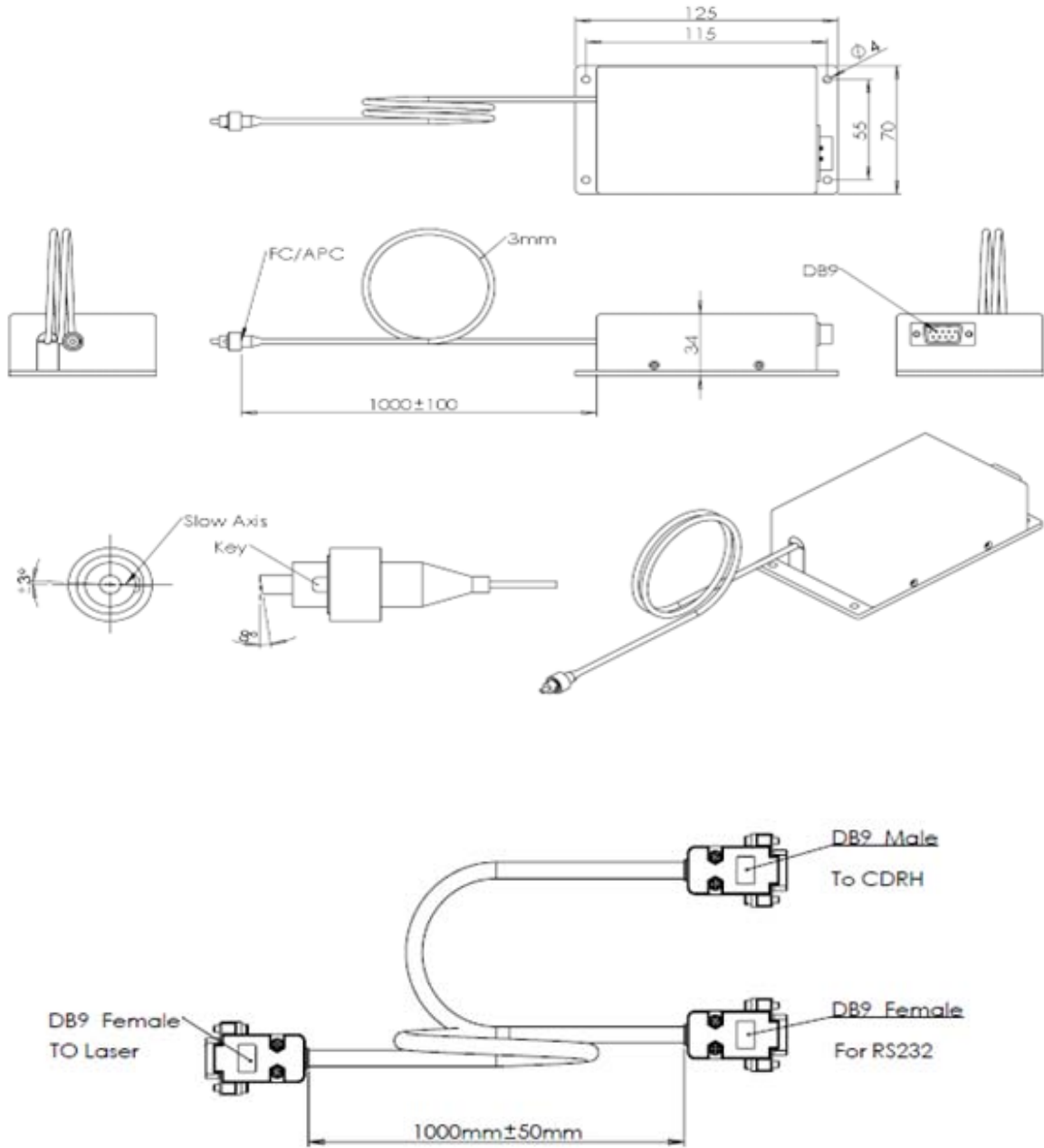
TABLE 4. Optional Electrical Interface

DB9 Connector PIN Assignment	Digital Interface	Analog Interface
1	LD_9V	LD_9V
2	Rx for RS232	NC
3	TEC_5V	TEC_5V
4	Tx for RS232	NC
5	TEC_GND	TEC_GND
6	NC	ADJ.
7	NC	Enable
8	GND for RS232	NC
9	LD_GND	LD_GND

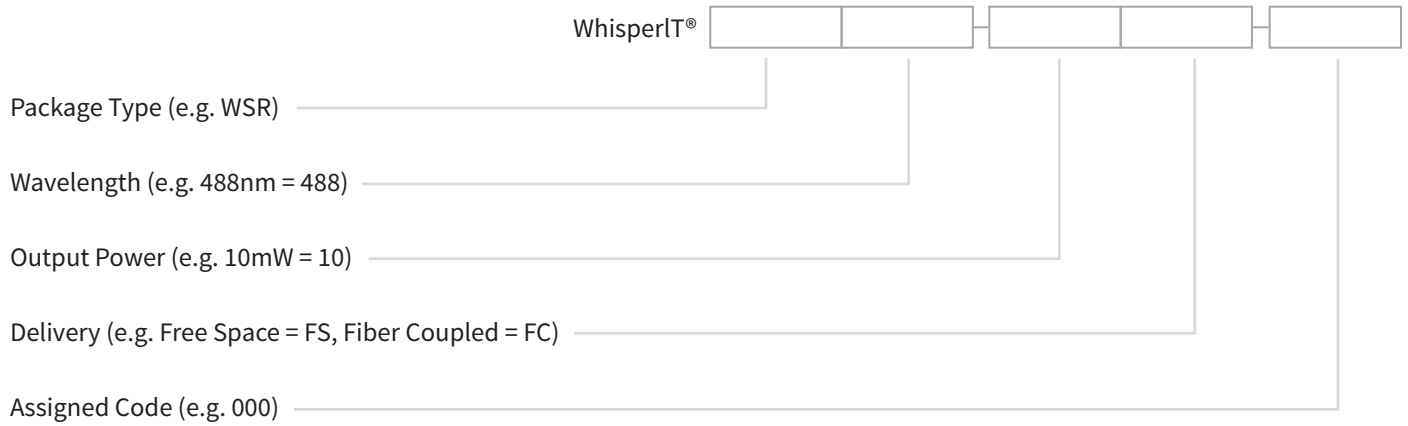
TABLE 5. Environment

PARAMETER	Conditions	Min.	Specifications Typ.	Max.	UNITS
Laser Head Dimension	L x W x H		125 × 70 × 34		mm
Laser Head Weight			400		g
Cable Length			1		m

MECHANICAL SPECIFICATIONS



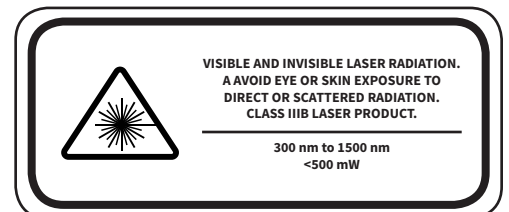
ORDER CODE



EXAMPLE: WSR488-20FC-000

This OEM laser does not comply with 21 CFR 1040.10 and 1040.11 without appropriate integration. Please contact Pavilion Integration Corp. for additional support or questions.

ISO9001 & ISO13485 Registered



Single Laser Remote with Power Supply

AC/DC CDRH Power Supplier compatible with WhisperIT® Lasers

The AC/DC CDRH Power Supplier is a small remote-control box that allows you to connect to - and interface with - a single laser head. This Single Laser Remote with Power Supply for WhisperIT® Lasers offers all the features from the laser in a convenient CDRH-compliant interface. You can use it to implement analog modulation control of the laser, such as switching the laser, and adjusting its power. Also, there are two status indicators on each AC/DC CDRH Power Supplier's top, for showing the voltage and total current.

We have four kinds of AC/DC CDRH Power Suppliers, for different lasers and different-area usages. Details are shown below:

- (1) 5V/5V CDRH Control Box Low active
- (2) 5V/5V CDRH Control Box High active
- (3) 5V/9V CDRH Control Box Low active
- (4) 5V/9V CDRH Control Box High active

Customer can do the selection per specific application.

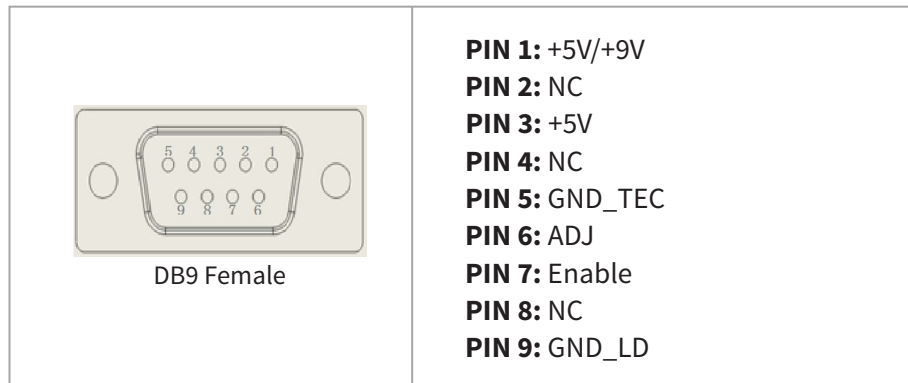
FEATURES

- » Friendly to use design
- » Laser safety features (CDRH) such as key switch and interlock
- » Full input and output connections for analog modulation control
- » Laser status indicators
- » Compact size
- » With mounting brackets

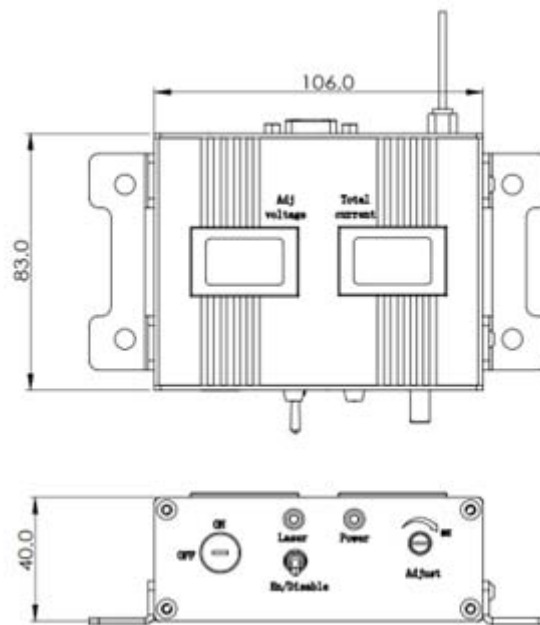
» APPLICATIONS

- » Applications that require analog control the laser
- » Applications that require laser control at a remote location away from the laser
- » Laboratories that require CDRH features





Laser control interface: 9-pin female connector



Mechanical Diagrams (unit: mm)

AC Adapter for the AC/DC CDRH Power Supplier



DESCRIPTION	SPECIFICATION
Input voltage	100V to 240V AC
Input current	0.55A
Input frequency	47Hz. to 63Hz.
Output voltage	12V DC
Rated current (max)	2.08A

Specifications of the AC Adapter

Whisper Comet®

Solid-State Detector Modules for Life Science

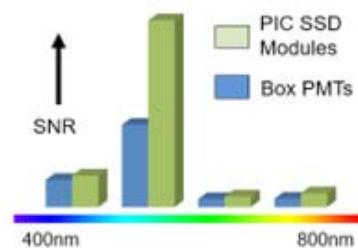
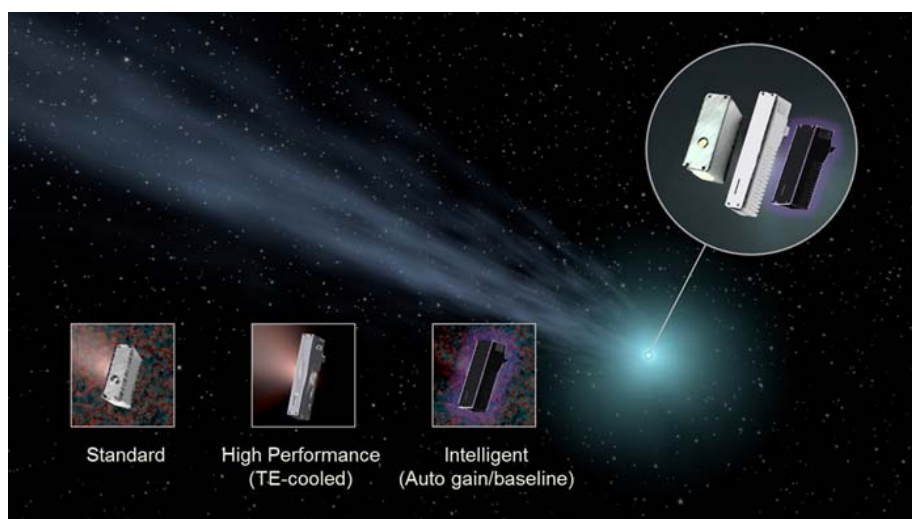
Solid-State Detectors (SSD), including avalanche photodiodes (APD), silicon photomultipliers (SiPM), and other semiconductor photo-detectors are evolving rapidly (thanks to the semiconductor industry). They can be packaged with cooling options, PCB layers, special optics and other functional components in a modular format for life science instrumentation with excellent performance and reliability. Together with PIC's innovative, compact, low-noise direct-diode lasers, they drive towards smaller, reliable, and highly integrated systems in diagnostics, clinical, and point-of-care applications.

FEATURES

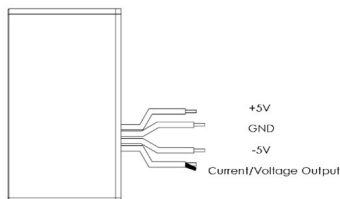
- » Scalable solid-state sensor
- » High quantum efficiency (even in NIR)
- » Superior reliability
- » Single-photon sensitivity
- » Ultra-compact
- » Integratable with function PCB layers

APPLICATIONS

- » Diagnostics
- » Clinical
- » Point-of-care
- » Flow Cytometry
- » DNA Sequencing
- » Medical Imaging
- » Confocal Microscopy
- » Optogenetics
- » Metrology
- » Semiconductor Instrumentation



PIC SSD modules have higher sensitivity, verified by various fluorescently-labeled 2µm beads.



PIC SSD modules input/output can be easily customized to specific instrument needs.



As for PIC's Standard SSD, here are 2 types of single-channel SSD, one is **Red wavelength enhanced SSD** (e.g. LPD0A3R1), the other one is **Blue wavelength enhanced SSD** (e.g. LPD0A3B2).

Red wavelength enhanced SSD (LPD0A3R1) Product Specifications

TABLE 1. General specs

PARAMETER	Min.	Specifications Typ.	Max.	UNITS
Input positive supplier voltage	+4.75	+5.0	+5.50	V
Positive current dissipation Note 1		100	130	mA
Input negative supplier voltage	-4.75	-5.0	-5.50	V
Negative current dissipation Note 2		50	80	mA
Spectral response range	350		1000	nm
Peak response wavelength		600		nm
Effective sensing area		Φ3		mm
Photoelectric sensitivity Note 3	4.5x10 ⁷	6.0x10 ⁷		V/W
Minimum detection limit Note 3		3	8	pW
I-V Conversion factor at high gain mode		750		V/A
Output offset voltage	-5		+5	mV
Rise time		50	120	ns
Operating ambient temperature	+5		40	°C
Storage ambient temperature	-20		60	°C

Note 1. Input positive supply voltage = +5V, Gain = 500, D.C. = 0, tested in darkness.

Note 2. Input negative supply voltage = -5V, Gain = 500, D.C. = 0, tested in darkness.

Note 3. Wavelength = 532 nm, Gain = 500, Dark compensation = 0.

TABLE 2. Interface Pinouts

Pin No.	Name	I/O	FUNCTION DESCRIPTION
1	+5.0V	Power supply	Analog negative power supply, +4.75 to +5.25 V
2	-5.0V	Power supply	Analog negative power supply, -4.75 to -5.25 V
3	GND	Power supply	Common mode input pin to set DC level of the differential output signals (Connected to ground usually)
4	V cont_1	Analog input	Gain adjust control, 0 to +1.2
5	Output Signal_1	Signal output	Positive output signal, 0 to +3V / Current output

MECHANICAL SPECIFICATIONS

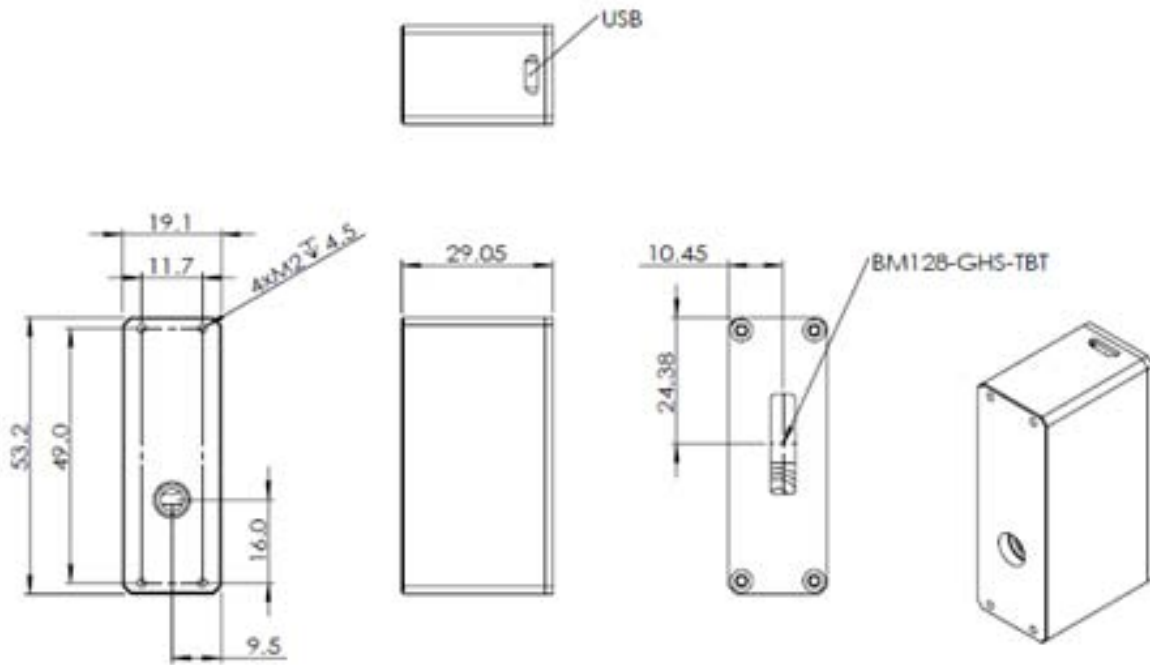


Figure 1. Module Schematic Drawing

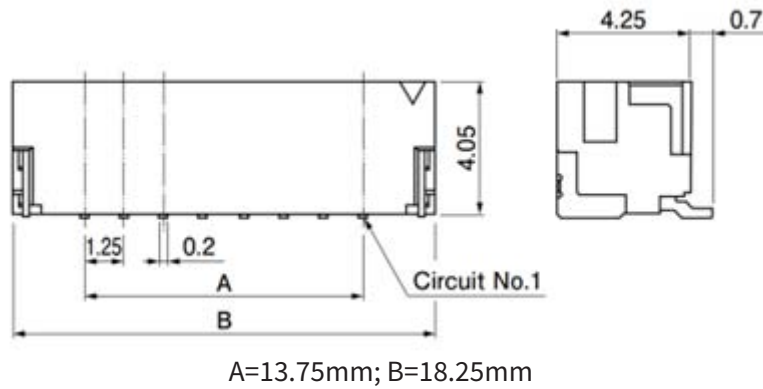
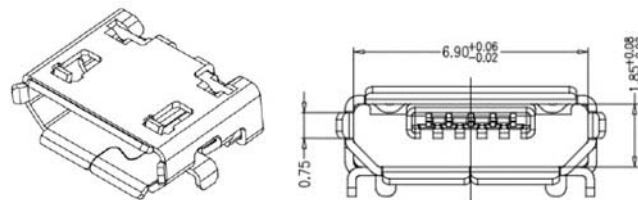


Figure 2. Interface Connector Drawing (JST GH PN: BM12B-GHS-TBT)



Gain setting range: 0 ~ 1023.
 Dark compensation setting range: 0 ~ 1023

Figure 3. Micro USB2.0 interface Connector to Set Gain and Dark Compensation

Chart 1. Typical Responses Charts

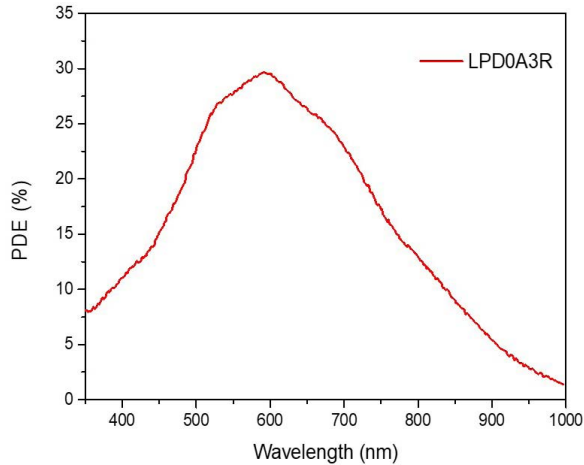


Fig 4a: Light Spectral Response

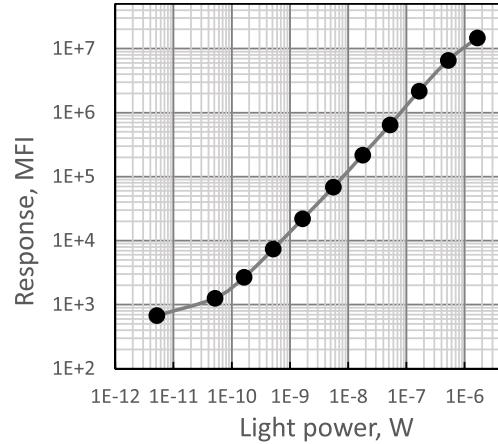


Fig 4b: Light Intensity Response

Blue wavelength enhanced SSD (LPD0A3B2) Product Specifications

TABLE 3. General specs

PARAMETER	Min.	Specifications Typ.	Max.	UNITS
Input positive supplier voltage	+4.75	+5.0	+5.50	V
Positive current dissipation Note 1		100	130	mA
Input negative supplier voltage	-4.75	-5.0	-5.50	V
Negative current dissipation Note 2		50	80	mA
Spectral response range	300		900	nm
Peak response wavelength		430		nm
Effective sensing area		3x3		mm
Photoelectric sensitivity Note 3	1.2x10 ⁷	1.8x10 ⁷		V/W
Minimum detection limit Note 3		2	5	pW
I-V Conversion factor at high gain mode		400		V/A
Output offset voltage	-5		+5	mV
Rise time		50	120	ns
Operating ambient temperature	+5		40	oC
Storage ambient temperature	-20		60	oC

Note 1. Input positive supply voltage = +5V, Gain = 500, D.C. = 0, tested in darkness.

Note 2. Input negative supply voltage = -5V, Gain = 500, D.C. = 0, tested in darkness.

Note 3. Wavelength = 532 nm, Gain = 500, Dark compensation = 0.

TABLE 4. Interface Pinouts

Pin No.	Name	I/O	FUNCTION DESCRIPTION
1	+5.0V	Power supply	Analog negative power supply, +4.75 to +5.25 V
2	-5.0V	Power supply	Analog negative power supply, -4.75 to -5.25 V
3	GND	Power supply	Common mode input pin to set DC level of the differential output signals (Connected to ground usually)
4	V cont_1	Analog input	Gain adjust control, 0 to +1.2
5	Output Signal_1	Signal output	Positive output signal, 0 to +3V/ Current output

MECHANICAL SPECIFICATIONS

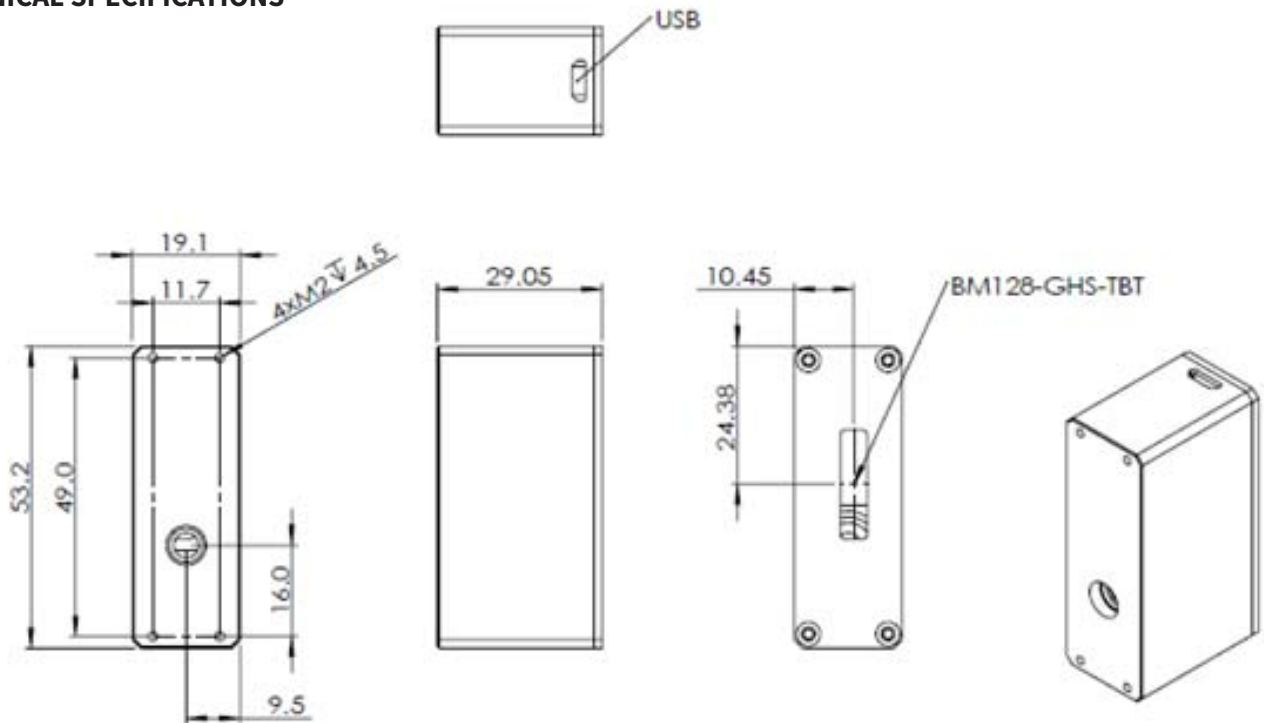


Figure 5. Module Schematic Drawing

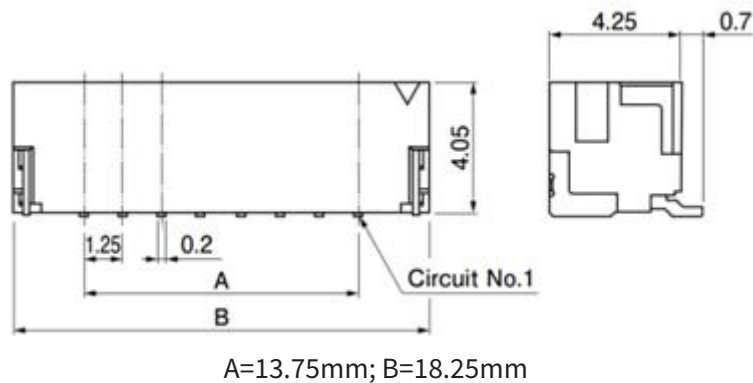
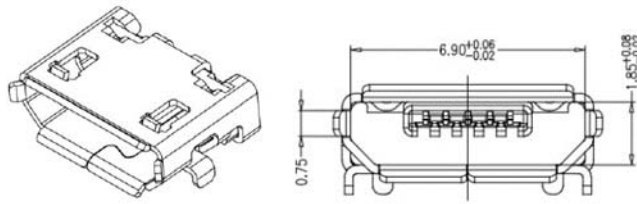


Figure 6. Interface Connector Drawing (JST GH PN: BM12B-GHS-TBT)



Gain setting range: 0 ~ 1023.
 Dark compensation setting range: 0 ~ 1023

Figure 7. Micro USB2.0 interface Connector to Set Gain and Dark Compensation

Chart 2. Typical Responses Charts

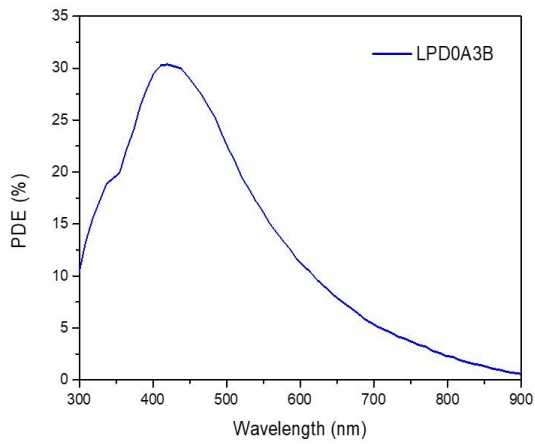


Figure 8a: Light Spectral Response

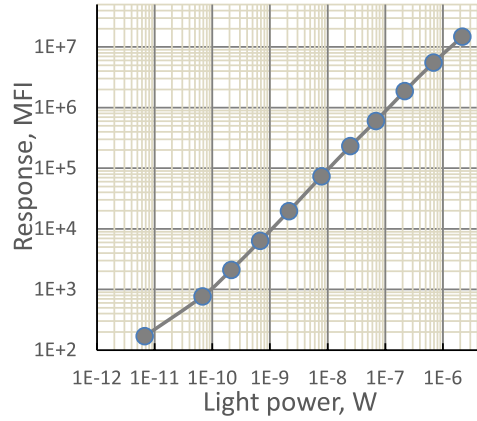


Figure 8b: Light Intensity Response

ORDER CODE

Whisper Comet

LPD	0	A	3	R	1
-----	---	---	---	---	---

Lapis Photo Detector

With or without cooler
(e.g. 0 = without cooler, 1 = with cooler)

Company Assigned

Photosensitive area (Φ 3mm)

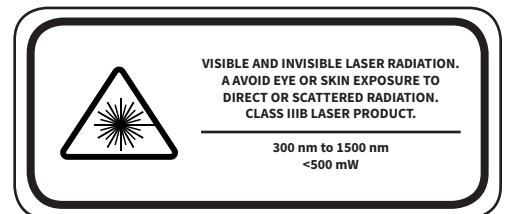
Red wavelength

Channel no.

EXAMPLE: LPD0A3R1

This OEM laser does not comply with 21 CFR 1040.10 and 1040.11 without appropriate integration. Please contact Pavilion Integration Corp. for additional support or questions.

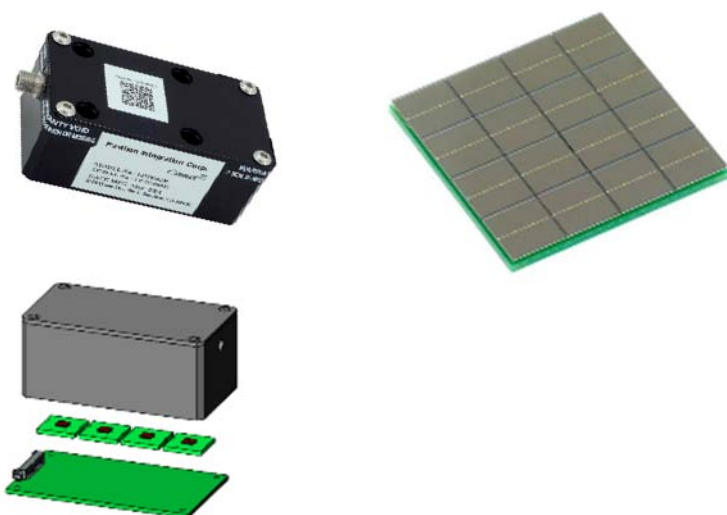
ISO9001 & ISO13485 Registered



Whisper QWDM®

Multi-ch Solid-State Detector Modules for Life Science

Solid-State Detectors (SSD), including avalanche photodiodes (APD), silicon photomultipliers (SiPM), and other semiconductor photo-detectors are evolving rapidly (thanks to the semiconductor industry). They can be packaged with cooling options, PCB layers, special optics and other functional components in a modular format for life science instrumentation with excellent performance and reliability. Together with PIC's innovative, compact, low-noise direct-diode lasers, they drive towards smaller, reliable, and highly integrated systems in diagnostics, clinical, and point-of-care applications.



FEATURES

- » High quantum efficiency
- » Blue and Red shifted options from 300-1050nm
- » Exact Form Fit Drop-in compatible replacement of PMT
- » TE-cooled version available
- » Built-in pre-amplifier
- » Current or voltage output
- » Standard 2, 3, up to 8-ch
- » The 24, 32, 64, and 72-ch array upon request
- » Cost-effective

APPLICATIONS

- » Diagnostics
- » Clinical
- » Point-of-care
- » Flow Cytometry
- » Medical Imaging
- » Confocal Microscopy
- » Metrology

MULTI-CHANNEL SSD PRODUCT SPECIFICATIONS

Multi-channel SSD array for detecting fluorescence signals, integrated with customer defined optical filters and fiber connector or collimated beam size in free space.

Standard multi-ch SSD module will be covering 2, 3, up to 8-ch.

PRODUCT SPECIFICATIONS

TABLE 1. General spec of SiPM

PARAMETER		Min.	Specifications Typ.	Max.	UNITS
Power On requirements					
Input positive supplier voltage		+4.75	+5.0	+5.50	V
Positive current dissipation *1			400	2000	mA
Input negative supplier voltage		-4.75	-5.0	-5.0	V
Negative current dissipation *2			100	500	mA
Operating temperature		+15		+35	oC
Storage temperature		-20		60	oC
Input Optics requirements					
Optical input	Fiber input	Fiber Core	0.2,0.4, 0.6, up to 0.8		mm
		Fiber NA	0.11,0.22,0.37, up to 0.6		
		Fiber Connector Type	FC-PC; FC-APC; SMA		
	Collimated beam in free space input	Beam diameter	Up to 7.0mm		mm
Detection channel and corresponding wavelength*3	Blue laser	SSC	488/10		mm
		FITC,Alexa Fluor™ 488	525/40		
		PE, PI	585/20		
		ECD	620/20		
		PC5,PerCP	675/20		
		PE-Cy7	780/50		
	Red laser	APC, Cy5	660/10		mm
		APC-A700, Cy5.5	720/30		
		APC-Cy7	780/50		
Peak wavelength*4	Blue enhanced		430		mm
	Red enhanced		600		
Effect photosensitive size		3		mm	V
Bandwidth		1.5	2		MHz
Max output voltage		3		V	V
Photoelectric sensitivity*5	Voltage output	0.7x10 ⁸	1.0x10 ⁸		V/W
	Current output	3.5x10 ⁴	5.0x10 ⁴		A/W
Temperature stability at 15-35 °C				±5	%
Detection limit power*5			5	10	pW

*1. A +5V power supply need to be 2000mA or higher.

*2. A -5V power supply need to be 500mA or higher.

*3. Other working wavelength are available upon request.

*4. Refer to photon detection efficiency vs wavelength, blue enhanced for <600nm channels.

*5. Tested with 532nm light, V_{adj} = 0.6V.

TABLE 2. Interface Definition of connector 1 (JST S12B-PADSS-1*)

PIN NO.	Name	I/O	Function description
1	+5.0V	Power supply	Analog positive power supply
2	-5.0V	Power supply	Analog negative power supply
3	Vadj_1	Analog input	External voltage in for gain adjustment. (0~1.2 V)
4	Vadj_2	Analog input	External voltage in for gain adjustment. (0~1.2 V)
5	Vadj_3	Analog input	External voltage in for gain adjustment. (0~1.2 V)
6	Vadj_4	Analog input	External voltage in for gain adjustment. (0~1.2 V)
7	GND	Power GND	Power GND
8	GND	Power GND	Power GND
9	GND	Signal GND	Signal GND
10	GND	Signal GND	Signal GND
11	GND	Signal GND	Signal GND
12	Vadj_5	Analog input	External voltage in for gain adjustment. (0~1.2 V)

*Connector will change with channel number;

TABLE 3. Interface Definition of connector2 (JST S10B-PADSS-1*)

PIN NO.	Name	I/O	Function description
1	Signal_1	Analog output	Analog voltage or current output
2	Signal_2	Analog output	Analog voltage or current output
3	Signal_3	Analog output	Analog voltage or current output
4	Signal_4	Analog output	Analog voltage or current output
5	Signal_5	Analog output	Analog voltage or current output
6	GND	Signal GND	Signal GND
7	GND	Signal GND	Signal GND
8	GND	Signal GND	Signal GND
9	GND	Signal GND	Signal GND
10	GND	Signal GND	Signal GND

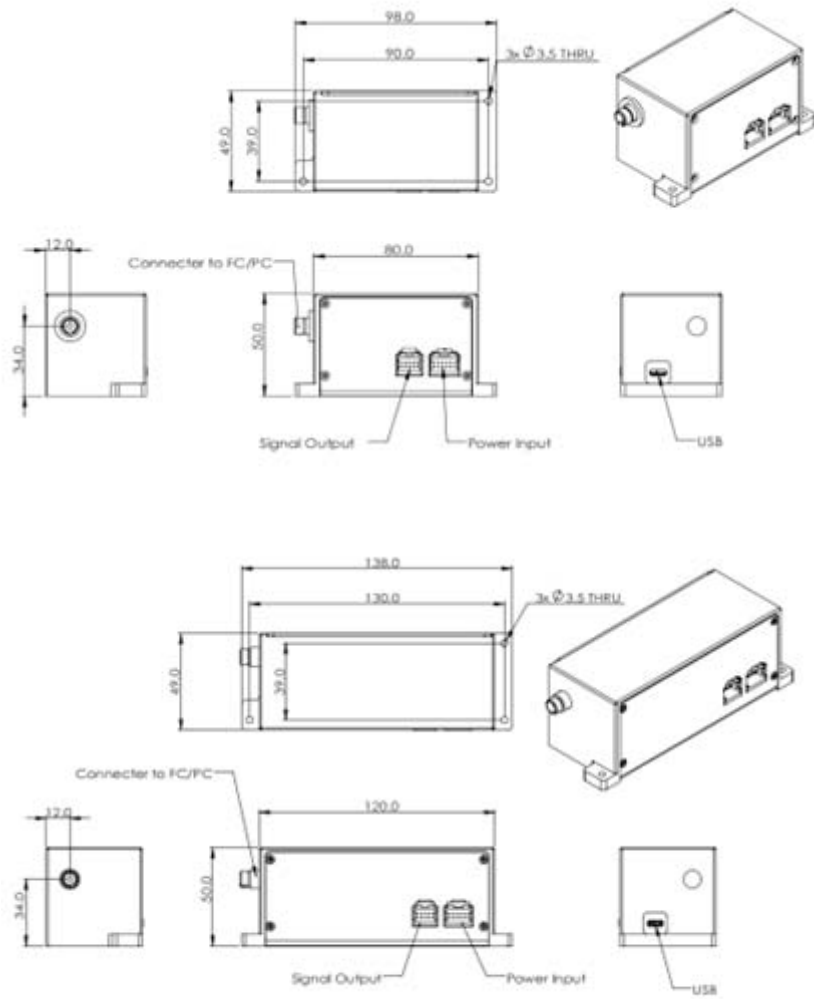
*Connector will change with channel number;

TABLE 4. Mechanical

PARAMETER	CONDITIONS	Min.	Specifications Typ.	Max.	UNITS
Dimension*	L x W x H				mm

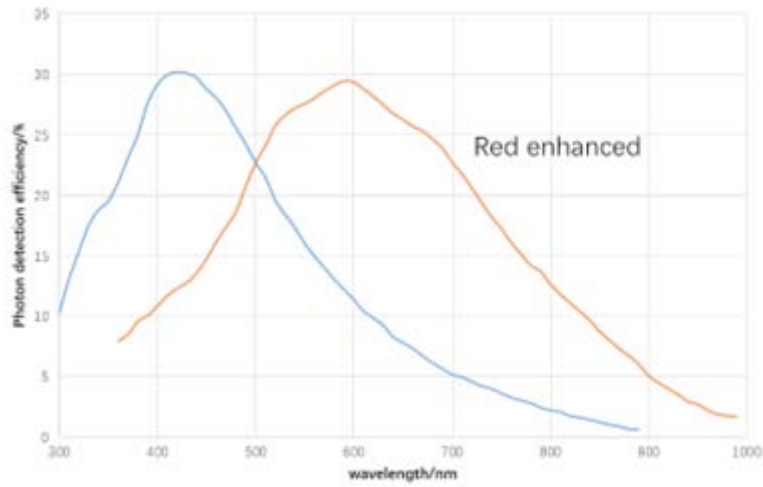
*Two dimension will be offering, one for 2-4ch, the other one for 5-8 ch.

MECHANICAL DIAGRAMS



Note. The mechanical diagrams is for fiber FC-PC input and 5-chs. USB is for internal use.

PHOTON DETECTION EFFICIENCY VS WAVELENGTH



ORDER CODE

Whisper QWDM®

LPD	0	A	3	R	1
-----	---	---	---	---	---

Lapis Photo Detector

With or without cooler
(e.g. 0 = without cooler, 1 = with cooler)

Company Assigned

Photosensitive area (Φ 3 or 3*3mm)

Red wavelength

Channel no.

EXAMPLE: LPD0A3R1

Lapis[®]

Integrated Multi Fiber-Delivered Module

This fiber delivered laser module is integrated with 4 lasers of different wavelengths (405nm, 488nm, 561nm and 638nm), and with their drive and control electronics in one package.

In CW operation, each individual laser has max 30mW optical output power, which can be turned on or turned off or adjusted by external voltages applied to the module.

The optical outputs are collimated to be “true” Gaussian beams with averaged 1.2mm beam waist diameters. The four wavelengths are coupled into one fiber with collimator.

Each laser output is featured with PIC patented Whisper IT technology, which enables super optical performances for low noise, low coherence and insensitive to back-reflection.

FEATURES

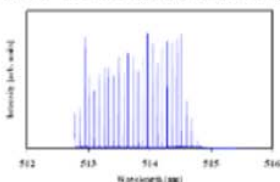
- » Better side-lobe control
- » Custom Focus beam
- » Highly integrated
- » Co-linear or separated beams
- » User-adjustable
- » Minimizes setup time
- » Minimizes time/cost to market
- » Custom wavelengths

APPLICATIONS

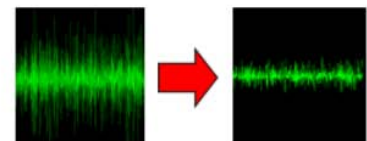
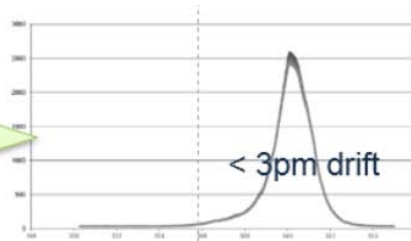
- » Flow Cytometry
- » Light Sheet Imaging
- » Confocal Microscopy



Laser diode and mode hop



Whisper IT[®]



Low Noise

PRODUCT SPECIFICATIONS

PARAMETER	Conditions	Min.	Specifications Typ.	Max.	UNITS
Max Optical Output Power (from Fiber)*	405 laser	25	27	30	mW
	488 laser	30	32	35	mW
	561 laser	30	32	35	mW
	638 laser	30	32	35	mW
Center Wavelength(@ Max Power)**	405 laser	400	405	410	nm
	488 laser	483	488	493	nm
	561 laser	556	561	566	nm
	638 laser	633	638	643	nm
Power Stability	8Hrs, $\Delta T < 5^{\circ}\text{C}$ @ RT, 5 min warm up			± 2	%
RMS Noise	10Hz - 2MHz			0.5	%
Beam Diameter(1/e ²)***	@50mm away from laser exit	0.9	1.2	1.5	mm
	@350mm away from laser exit	0.9	1.2	1.5	mm
Polarization Extinction Ratio	@Max Power	17			dB
Beam Quality (M ²)	TEM00			1.2	
Fiber Jacket			3		mm
Output Concentricity				± 2.5	mrad
Output Eccentricity	@10mm away from laser exit			± 0.5	mm

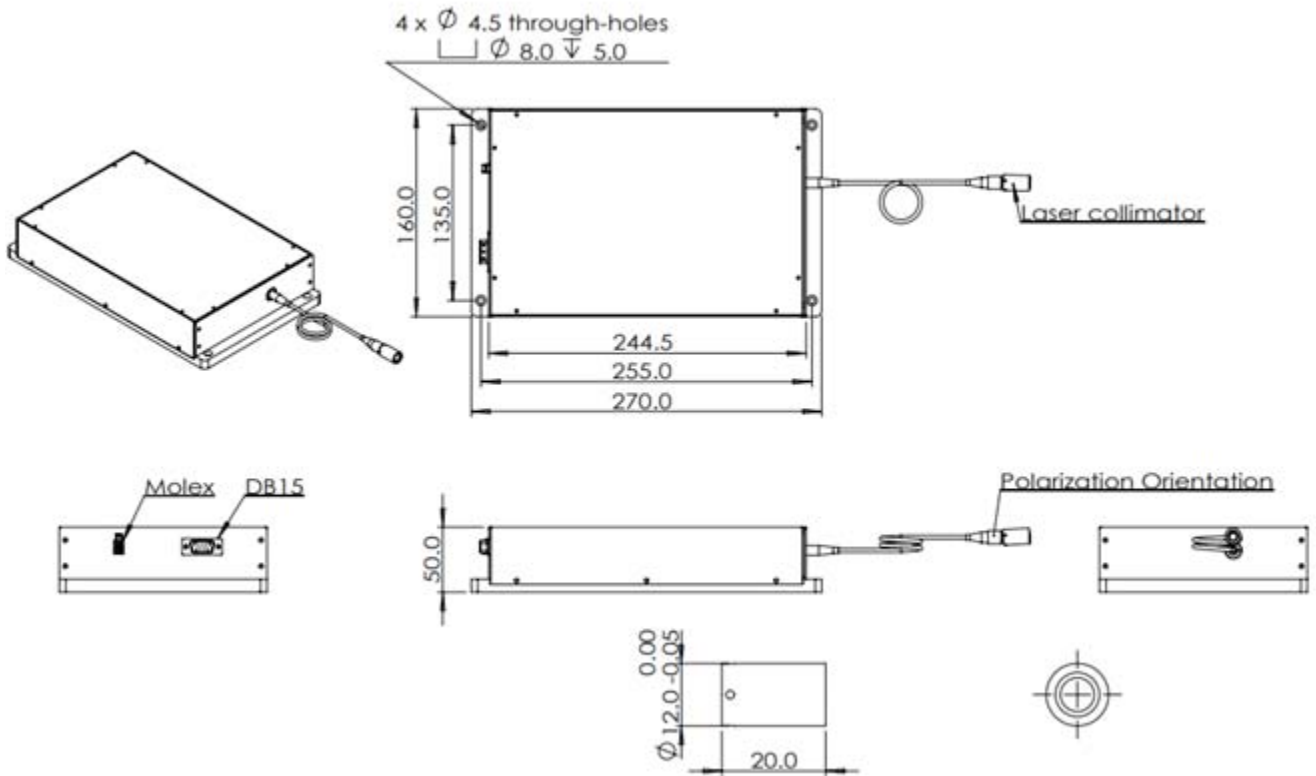
*Output power is up to 100mW (405nm 50mW).

**Other wavelengths are available to offer upon request.

***Other beam diameters are available upon request.

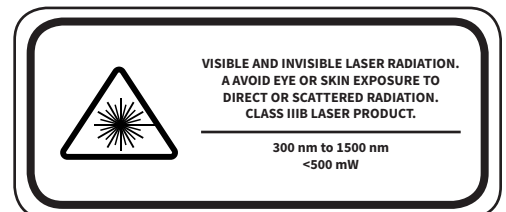
PARAMETER	Conditions	Min.	Specifications Typ.	Max.	UNITS
Input Voltage	LD	11.8	12	12.2	VDC
	LD	4.8	5	5.2	VDC
	TEC	4.8	5	5.2	VDC
Current Consumption	LD			0.5	A
	LD			0.5	A
	TEC			7.5	A
Power Stability	8Hrs, $\Delta T < 5^{\circ}\text{C}$ @ RT, 5 min warm up			± 2	%
Heat Dissipation				44	W

MECHANICAL SPECIFICATIONS



This OEM laser does not comply with 21 CFR 1040.10 and 1040.11 without appropriate integration. Please contact Pavilion Integration Corp. for additional support or questions.

IS09001 & IS013485 Registered



Lapis®

Integrated Multi-laser Module - 3 or 4 lasers integrated module

Lapis 3 or 4 lasers integrated module, is an integrated optical plate with four lasers channels that focus at the same focal plane. Quasi-laser channels include the 405nm, 488nm, 561nm and 638nm lasers. The final focal plane is user-adjustable and the beam spot position is precisely controllable.

As for the 4-laser module, it is up to four addressable output laser wavelengths (from typical 405 nm, 488 nm, 561 nm, and 638 nm and other wavelengths) with custom focus and independent user-adjustable position. Custom wavelengths for OEMs.

Incorporates up to four PIC lasers. Lapis 4-laser module reduces cost, space and complexity by eliminating electronic redundancy. Minimizes setup time for researchers and time/cost to market for instrument OEMs. Ideal for flow cytometry with co-linear or separated beams.



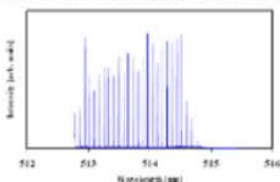
FEATURES

- » Better side-lobe control
- » Custom Focus beam
- » Highly integrated
- » Co-linear or separated beams
- » User-adjustable
- » Minimizes setup time
- » Minimizes time/cost to market
- » Custom wavelengths

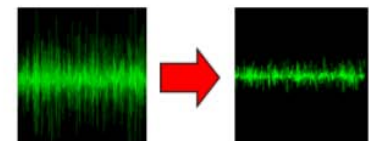
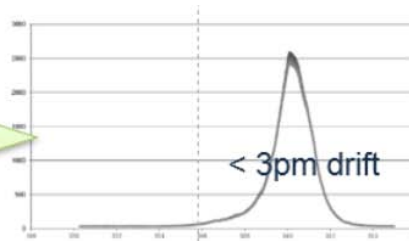
APPLICATIONS

- » Flow Cytometry
- » Diagnostics
- » Clinical
- » Point-of-care
- » DNA Sequencing
- » Medical Imaging
- » Confocal Microscopy
- » Optogenetics
- » Metrology
- » Semiconductor Instrumentation

Laser diode and mode hop



Whisper IT®

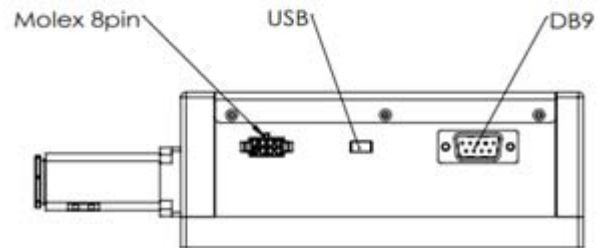
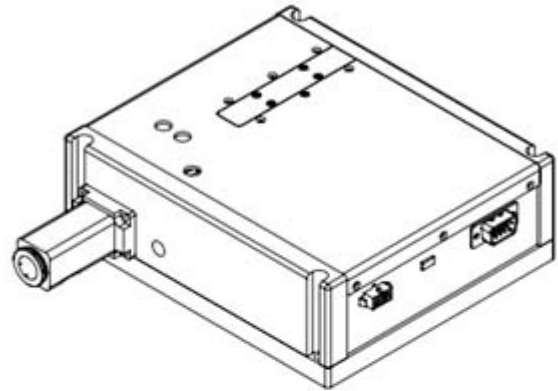
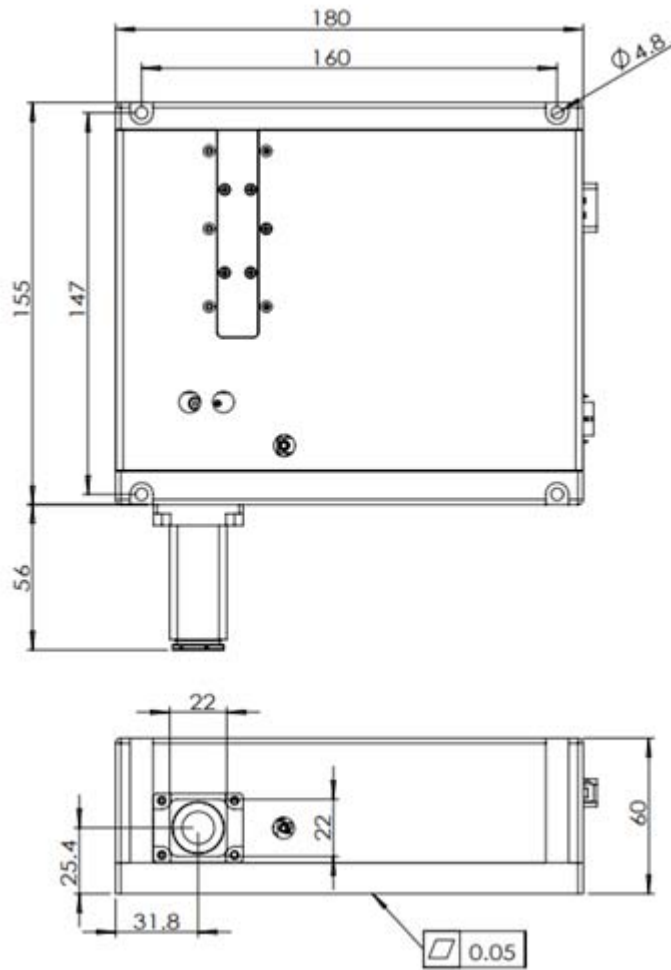


Low Noise

TABLE 1. Product Specifications

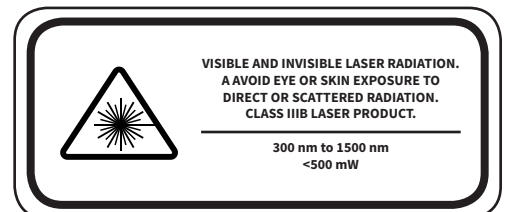
		3 - laser	4 - laser
	Wavelength (nm)	1) 405/488/638 2) 405/532/638 3) Other combinations are available	638/650/660; 532/544/553/561/580; 488; 405/450
Max. Output Power	638/650/660nm	100mW	100mW
	532/544/553/561/580nm	100mW	100mW
	488nm	100mW	100mW
	450nm	100mW	100mW
	405nm	150mW	150mW
Long-term Power Stability (8hrs, ±3°C)		<2%	<2%
RMS Noise (20Hz - 2MHz)		<0.25%	<0.25%
Peak-to-Peak Noise (20Hz - 20kHz)		<1%	<1%
Beam Size	Collimated	0.5mm to 3mm	100mW
	Circle or Ellipse	0.5mm to 3mm	100mW
	Circle or Ellipse	100mW	100mW
	Focused Vertical (µm)	10---30 (Optional)	10---30 (Optional)
	Focused Horizontal (µm)	30--200 (Optional)	30--200 (Optional)
Focus Side-lobes Vertical (% of peak)		<5% or <3% (Optional)	<5% or <3% (Optional)
Laser out height From Base Plate (mm)		25.4	25.4
Adjustable	Vertical Adjustment (µm)	±100	±100
	Horizontal Adjustment (µm)	±100	±100
	Focus Adjustment (mm)	±3	±3
Size	Built in PCBA (mm)	130 x 176 x 60	155 x 180 x 60
	External PCBA (mm)		155 x 180 x 52.2
Options Accessory	Heat Sink	With customized Heat sink to strengthen stability	
	Focusing Lens	1. With focused lens Accessory 2. Discrete focused lens Fixed in flow cell 3. Discrete focused lens fixed in Base Plate	

MECHANICAL SPECIFICATIONS



This OEM laser does not comply with 21 CFR 1040.10 and 1040.11 without appropriate integration. Please contact Pavilion Integration Corp. for additional support or questions.

IS09001 & IS013485 Registered



Lapis® Multi-Laser Engine

High-power, Multi-mode Fiber Delivery

The Lapis® Multi-laser Engine delivers up to 1,000 mW of output power at the distal end of an optical fiber from each of its individually lasers. The light output port has a built-in adapter for facile connection to microscopes and other bioanalytical instruments through a SMA-terminated optical fiber. These capabilities are assembled in a compact bench-top unit.

Lapis® Multi-laser Engines feature an advanced control system based on an onboard computer with an embedded command library. This allows control using simple and intuitive text string commands sent to the light engine via USB/RS-232 or TCP serial protocols. These commands give access not only to the basic control functions of light source selection, on/off switching and output intensity adjustment, but also to an extensive panel of operating status reports and advanced control features.

Long-term stability is sustained by active power control circuitry. The light output is monitored and controlled using an internal feedback loop to maintain constant output over time.

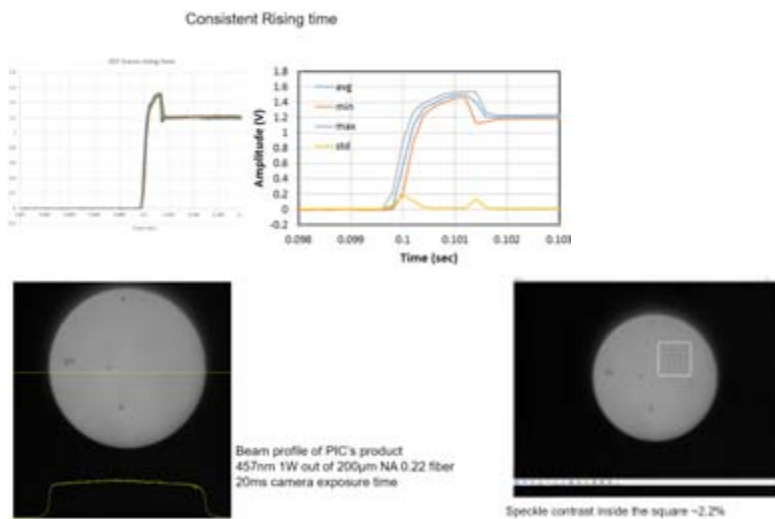
As are all Pavilion products, our Lapis Multi-laser Engines are pre-aligned, maintenance free and mercury free. OEM customization available upon request.

FEATURES

- » Up to 9 wavelengths
- » From 375 to 1064 nm
- » Adjustable output power
- » Multi-mode fiber output
- » Speckle reduction
- » Fast rise/fall time

APPLICATIONS

- » High throughput imaging microscopy
- » Confocal microscopy
- » Biomedical instrument
- » High throughput DNA sequencing
- » Spatial genomics
- » Structured light illumination



PRODUCT SPECIFICATIONS

TABLE 1. Optical

PARAMETER	Conditions	Min.	Specifications Typ.	Max.	UNITS
CW Mode Output Power from Fiber	405nm laser		0.3		W
	445nm laser		1		W
	470nm laser		1		W
	520nm laser		0.5		W
	555nm laser		1		W
	640nm laser		0.4		W
	730nm laser		0.7		W
Peak Laser Wavelength	405nm laser	397	405	407	nm
	445nm laser	438	445	450	nm
	470nm laser	463	470	470	nm
	520nm laser	514	520	523	nm
	555nm laser	552	555	557	nm
	640nm laser	632	640	644	nm
	730nm laser	725	730	735	nm
Power Stability, after 10 min Warm up*(1)	8Hrs in CW mode (25±1°C)	-1%		+1%	
Rise/Fall Time				5	ms
Pulse width		20		CW	ms
Power Adjustment*(1)		20		100	%
Fiber Connector			SMA905		

Footnote 1: 20% to 100% output power meeting specification, power adjustment range is 5% to 100%. Power stability test is conducted at full power.

TABLE 2. Electrical

PARAMETER	Conditions	Min.	Specifications Typ.	Max.	UNITS
Total Power Dissipation			305		W
Supply Current			12.7		A
Supply Voltage		21.6	24	26.4	V

FIRMWARE AND COMMAND FUNCTIONS

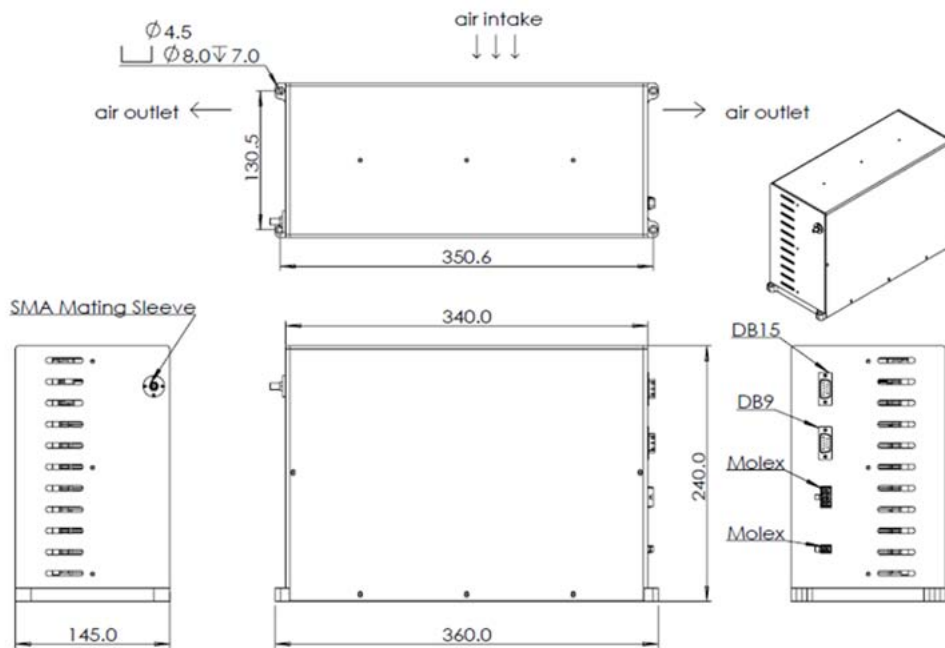
Laser engine firmware provides the below functions via interface RS232.

1. Report laser status (on or off) of each channel
2. Set output power for each channel
3. Report output power for reference from each channel
4. Turn on or turn off an individual laser of each channel
5. Turn on/off all lasers with one command

TABLE 2. Mechanical

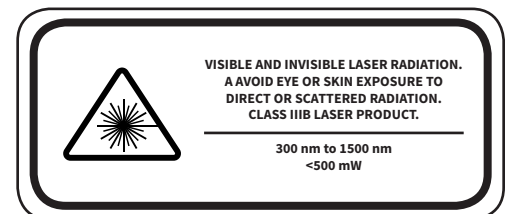
PARAMETER	Conditions	Min.	Specifications Typ.	Max.	UNITS
Laser Head Dimension	L x W x H		360 x 145 x 240		mm

MECHANICAL SPECIFICATIONS



This OEM laser does not comply with 21 CFR 1040.10 and 1040.11 without appropriate integration. Please contact Pavilion Integration Corp. for additional support or questions.

ISO9001 & ISO13485 Registered



WhisperIT® Excitation Modules

Whisper Plus, WCP Plus and WMN Plus

Whisper Plus Series are upgraded versions of the Whisper Series. WhisperIT® Series are laser diode-based continuous-wave solid-state lasers that offer ultra-Low Noise, significantly reduced footprint, increased lifetime, and improved efficiency over DPSS, HeCd, HeNe and Argon lasers. The proprietary WhisperIT® technology eliminates mode hops and delivers lasers with extremely low optical noise.

The Whisper Plus Series comprised of Whisper Plus, WMN Plus and WCP Plus. Through the shaping of the laser light located inside the laser, the laser is able to provide a focused light spot for flow cytometry applications. It is designed for superior optical power, stability, and beam quality. Its superior optical power and stability ensure it is well suited for demanding applications. Its beam quality and power output make it ideal for flow cytometry applications.

It is easy to integrate into existing systems and its compact size allows for easy installation and maintenance. Whisper Plus Series has a long lifetime and low power consumption, making it a reliable and cost-effective solution especially for FCM application.

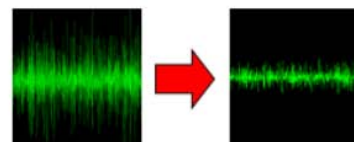
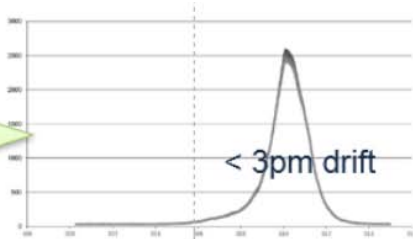
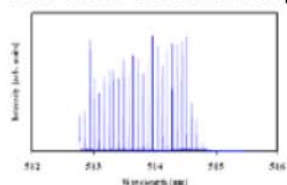
FEATURES

- » Ultra-Low Noise
- » Low Coherence
- » Mode-hop Free
- » Integrated Control Electronics
- » Digital / Analog Modulation

APPLICATIONS

- » Flow Cytometry
- » DNA Sequencing
- » Medical Imaging
- » Confocal Microscopy
- » Optogenetics
- » Metrology

Laser diode and mode hop



Low Noise

THE WHISPER PLUS SERIES - WHISPER PLUS, WMN PLUS AND WCP PLUS:



PRODUCT SPECIFICATIONS

Choose laser wavelength of 488 nm as an example. Other wavelengths are available.

TABLE 1. Optical

PARAMETER	Conditions	Min.	Specifications Typ.	Max.	UNITS
Max. Optical Output Power	CW Mode From beam exit	41	43	45	mW
Lasing Wavelength	Max Power	486	488	490	nm
Power Stability (1)	8 hrs, 10 mins Warm-up time			1%	
Noise	RMS Noise	20Hz - 2MHz		0.5%	
	Peak-to-Peak Noise	20Hz - 2MHz		2%	
Beam Height at 1/e ² Working Distance from laser edge (2)	Measured at V-focal plane	8		22	um
Beam Width at 1/e ² Working Distance from laser edge (2)	Measured at V-focal plane	60		250	um
Working Distance	From laser Front panel to V-focal plane	30		60	mm
Polarization Extinction Ratio		50:1			
Polarization Orientation	Vertical			±3.0	°
Focus Beam Side Lobe	Max Power			5%	
Focus Beam Space Shape	Max Power		Single Mode, no space hollow		

Note 1 and Note 2: Test temperature is 25±2°C.

Note 2: Other beam sizes are available upon custom request.

TABLE 2. Alignment

PARAMETER	Conditions	Min.	Specifications Typ.	Max.	UNITS
Beam Pointing Stability	Over 8hrs after warming up and ±3°C			10	urad/°C
Static Beam Alignment	Angle		±2.5		mrad
Static Beam Alignment	Position		±0.5		mm

TABLE 3. Environment

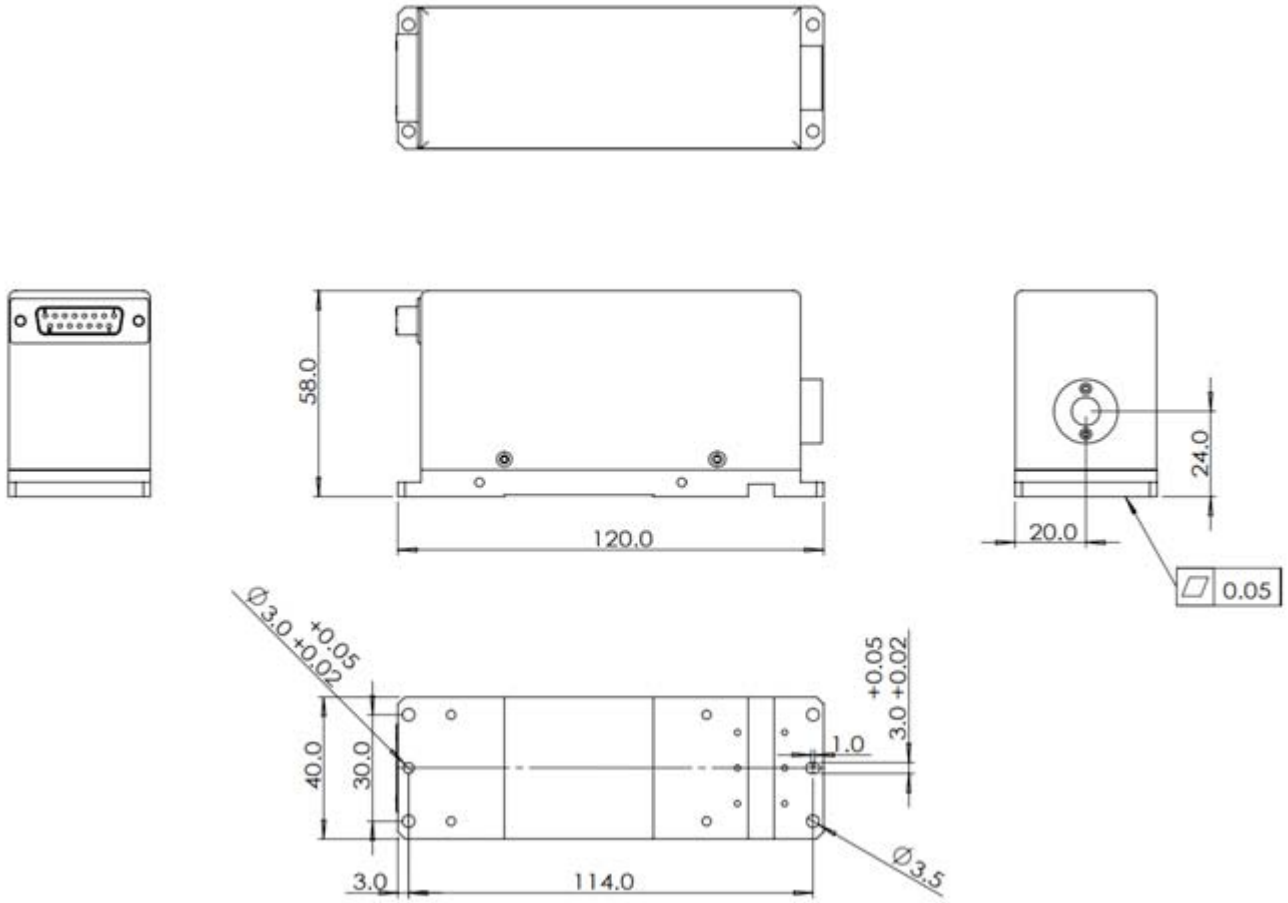
PARAMETER	Conditions	Min.	Specifications Typ.	Max.	UNITS
Beam Pointing Stability	Over 8hrs after warming up and $\pm 3^{\circ}\text{C}$			10	urad/ $^{\circ}\text{C}$
Static Beam Alignment	Angle		± 2.5		mrاد
Static Beam Alignment	Position		± 0.5		mm
Base Plate Temperature	Operating	10	28	40	$^{\circ}\text{C}$
Base Plate Temperature	Non-operating	-10		50	$^{\circ}\text{C}$
Internal Module Temperature	Operating		28		$^{\circ}\text{C}$
Shock (11ms duration)	Operating		1		g
Shock (11ms duration)	Non-operating		25		g
Vibration (5Hz – 500Hz)	Operating		0.3		g
Vibration (5Hz – 500Hz)	Non-operating		2		g
Humidity	Non-condensing	10		90%	

TABLE 4. Electrical Specification

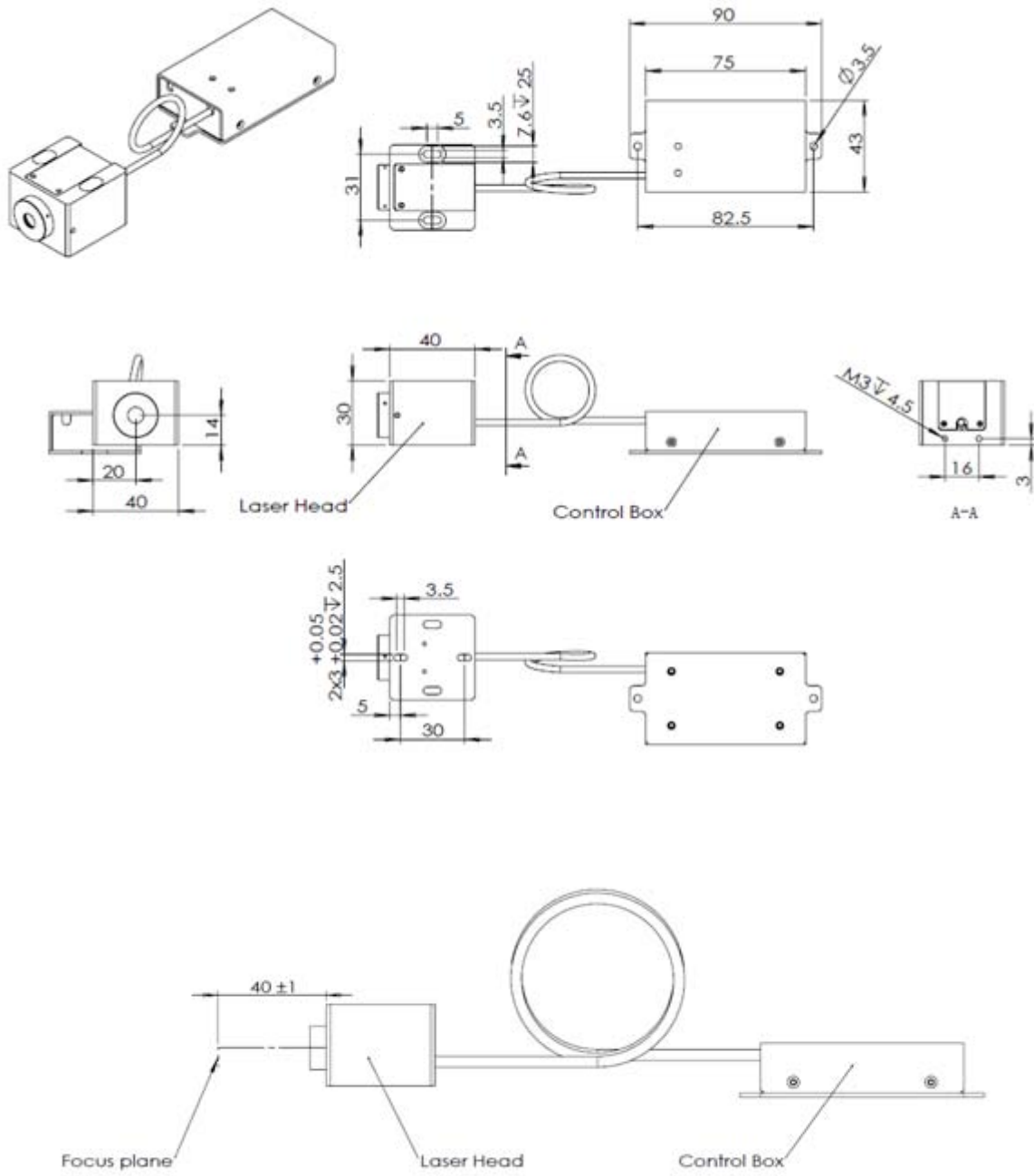
DB9 Connector PIN Assignment	Digital Interface	Analog Interface
1*	LD_5V or 9V or 12V	LD_5V or 9V or 12V
2	Rx for RS232	NC
3	TEC_5V	TEC_5V
4	Tx for RS232	NC
5	TEC_GND	TEC_GND
6	NC	ADJ
7	NC	Enable
8	GND for RS232	NC
9	LD_GND	LD_GND

*405/488/505/515nm LD driving voltage: 9V or 12V; 532/561/638/785nm LD driving voltage: 5V

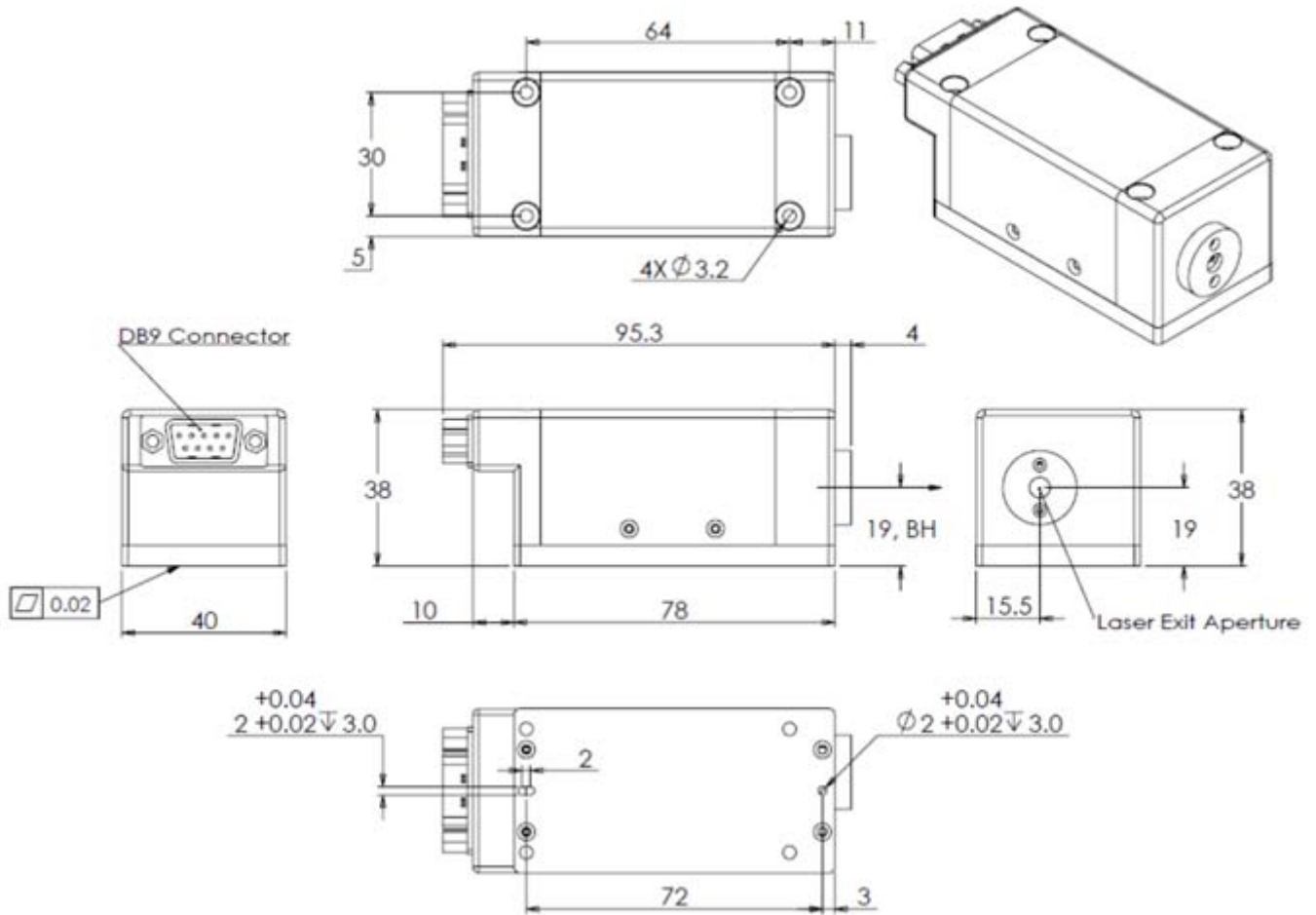
MECHANICAL SPECIFICATIONS (WHISPER PLUS)



MECHANICAL SPECIFICATIONS (WMN PLUS)

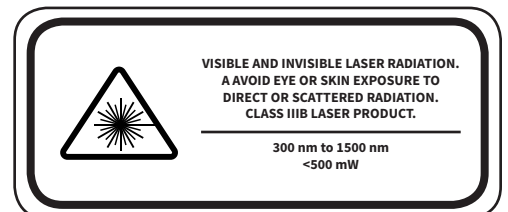


MECHANICAL SPECIFICATIONS (WCP PLUS)



This OEM laser does not comply with 21 CFR 1040.10 and 1040.11 without appropriate integration. Please contact Pavilion Integration Corp. for additional support or questions.

ISO9001 & ISO13485 Registered



BASOE®

Integrated Multi-laser & Multi-channel Optical Engine

BASOE (Biomedical Application Specific Optical Engine) is an optical platform with single or multi-laser that focus into the flow cell at customer specified beam overlap and spacing. The multi-laser optical platform is built with an integrate module with 523nm, 638nm and 405nm lasers (or other lasers with customized wavelengths) inside, laser beam shaping optics, and beam combining optics, and is delivering the final focused beam to the flow cell meeting customer specification.

The optical platform is designed with the customer-adjustable beam positioning and focusing. Based on what we agreed with customer under separated notice and specification, this optical platform shall incorporate the custom-specific flow cell, filters, and SiPM detectors, and it's to be assembled and tested to the customer requirements.

Depend on different kind of requirements, PIC will provide the one-stop ready-to-use solutions with

1 laser, 2-ch;

2-laser, 4-ch or 6-ch;

3-laser 8-ch or 10-ch;

or other customized configurations

in this custom module.



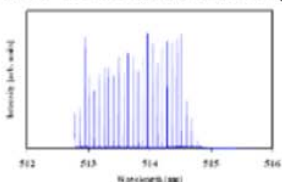
FEATURES

- » Up to 3-laser, 10-ch.
- » Individual serviceable laser channel
- » Custom focus beam
- » Highly integrated
- » Co-linear or separated beams
- » User-adjustable
- » Fast time-to-market
- » Cost-saving
- » Custom wavelengths

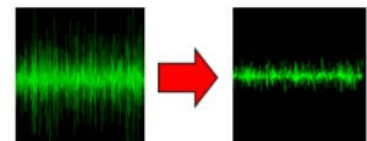
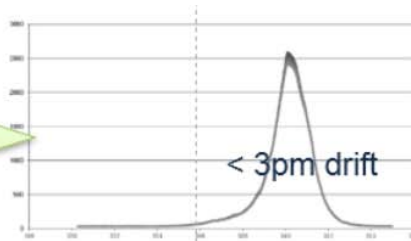
APPLICATIONS

- » Flow Cytometry
- » Multiplexing
- » Q-PCR
- » Hematology
- » Diagnostics
- » Clinical
- » Point-of-care
- » Optogenetics
- » Metrology
- » HLA Typing
- » Cytokine test
- » Cancer screening

Laser diode and mode hop



Whisper IT®



Low Noise

PRODUCT SPECIFICATIONS (E.G. RGV MODULE)

TABLE 1. Laser Engine Optical*

PARAMETER	Conditions	Min.	Specifications Typ.	Max.	UNITS	
Channel 1	Lasing Wavelength	Max. Power	528	531	534	nm
Channel 2	Lasing Wavelength	Max. Power	634	637	640	nm
Channel 3	Lasing Wavelength	Max. Power	400	405	410	nm
Channel 1	Max. Optical Output Power**	CW Mode	50	51	52	mW
Channel 2	Max. Optical Output Power**	CW Mode	20	21	22	mW
Channel 3	Max. Optical Output Power*	CW Mode	20	21	22	mW
Channel 1	Blocking Optical Power	@1059-1069nm	4			OD
Channel 2	Blocking Optical Power 1	@ 657-800nm	6			OD
	Blocking Optical Power 2	@ 650 – 657nm	3			OD
Channel 3	Blocking Optical Power	@420-440nm	3			OD
Power Stability	8Hrs, T<3°C			±1.0		%
RMS Noise	20Hz – 2MHz			0.5		%
Beam Quality (M ²)	TEM00	1.0		1.3		
Vertical Beam Height @ 1/e ²	at the vertical focal plane	20	22	25		µm
Horizontal Beam Width @ 1/e ²	at the vertical focal plane	95	98	105		µm
Polarization Orientation (reference to baseplate)	Vertical	0		±2		°
Polarization Extinction Ratio		17				dB
Warm-up Time (output power)	Cold Start from ambient temp. 15-30 °C			1		min

* Stress release to be performed before final test.

** Optical output power is measured at the focus lens output at a specified distance.

TABLE 2. Reception Channel

Channel Name	Specifications
FSC	Working Spectrum 532nm
GSSC	Working Spectrum 532nm
FL1	Working Spectrum 545-625nm
RSSC	Working Spectrum 637nm
CL1	Working Spectrum 649-667nm
CL2	Working Spectrum 701-715nm
CL3	Working Spectrum 750nm
VSSC	Working Spectrum 405nm
CL0	Working Spectrum 459-750nm

TABLE 3. Laser Engine Alignment*

PARAMETER	Conditions	Min.	Specifications Typ.	Max.	UNITS
Beam pointing stability*	22.5±5°C, at the focal plane	-15		15	µm
Laser Static Beam Height	From base plate	18.5	19.0	19.5	mm
Static Beam Alignment	Angle			±2.5	mrاد
Beam spacing in the V-plane (Green beam is at the center of the flow. red beam is 50µm down by the flow direction)	Measured at the vertical focal plane		-50		µm
Beam overlap at the horizontal plane	Measured at the center beam position at the vertical focal plane	-15		15	µm

*DVT and production sampling test to be performed on beam pointing stability.

TABLE 4. Laser Engine Electrical *

PARAMETER	Conditions	Min.	Specifications Typ.	Max.	UNITS
Beam pointing stability*	22.5±5°C, at the focal plane	-15		15	µm
Laser Static Beam Height	From base plate	18.5	19.0	19.5	mm
Static Beam Alignment	Angle			±2.5	mrاد
Beam spacing in the V-plane (Green beam is at the center of the flow. red beam is 50µm down by the flow direction)	Measured at the vertical focal plane		-50		µm
Beam overlap at the horizontal plane	Measured at the center beam position at the vertical focal plane	-15		15	µm

TABLE 4. Laser Engine Electrical *

PARAMETER	Conditions	Min.	Specifications Typ.	Max.	UNITS	
Channel 1 (532nm)	22.5±5°C	Input Voltage (TEC)	4.8	5	5.2	VDC
		Voltage Ripple (TEC)			5	%
		Current Consumption (TEC)			1.7	A
		Input Voltage (LD)	4.8	5	5.2	VDC
		Voltage Ripple (LD)			5	%
		Current Consumption (LD)			0.5	A
		Laser Head Heat Dissipation (Steady at 30°C Baseplate)			10	W
		Total Power Consumption (Steady at 30°C Baseplate)			12.5	W
		Laser Connector	Molex Nano-Fit105307-2205	Pin1: +5V Pin2: NC Pin3: GND Pin4: GND Pin5: Power monitor(40mV/mW)		
Channel 2 (637nm)	22.5±5°C	Input Voltage (TEC)	4.8	5	5.2	VDC
		Voltage Ripple (TEC)			5	%
		Current Consumption (TEC)			1.7	A
		Input Voltage (LD)	4.8	5	5.2	VDC
		Voltage Ripple (LD)			5	%
		Current Consumption (LD)			0.2	A
		Laser Head Heat Dissipation (Steady at 30°C Baseplate)			10	W
		Total Power Consumption (Steady at 30°C Baseplate)			11	W
		Laser Connector	Molex Nano-Fit105307-2205	Pin1: +5V Pin2: Power adjustment (0~2.6V, 0~100%; 2.6~5V, 100%) Pin3: GND Pin4: GND Pin5: Power monitor(40mV/mW)		
Channel 3 (405nm)	22.5±5°C	Input Voltage (TEC)	4.8	5	5.2	VDC
		Voltage Ripple (TEC)			5	%
		Current Consumption (TEC)			1.7	A
		Input Voltage (LD)	8.6	9	9.4	VDC
		Voltage Ripple (LD)			5	%
		Current Consumption (LD)			0.2	A
		Laser Head Heat Dissipation (Steady at 30°C Baseplate)			10	W
		Total Power Consumption (Steady at 30°C Baseplate)			12	W
		Laser Connector	Molex Nano-Fit105307-2205	Pin1: +5V Pin2: +9V Pin3: GND Pin4: GND Pin5: Power monitor(40mV/mW)		

TABLE 5. Mechanical

PARAMETER	Conditions	Min.	Specifications Typ.	Max.	UNITS
Optical Plate	L x W x H		300 x 300 x 79.2		mm
Cable Type	1/8" Polyester expandable sleeve (Mfr.: Alpha Wire)				
Cable Length	For each channel		75		mm

MECHANICAL SPECIFICATIONS (WCP PLUS)

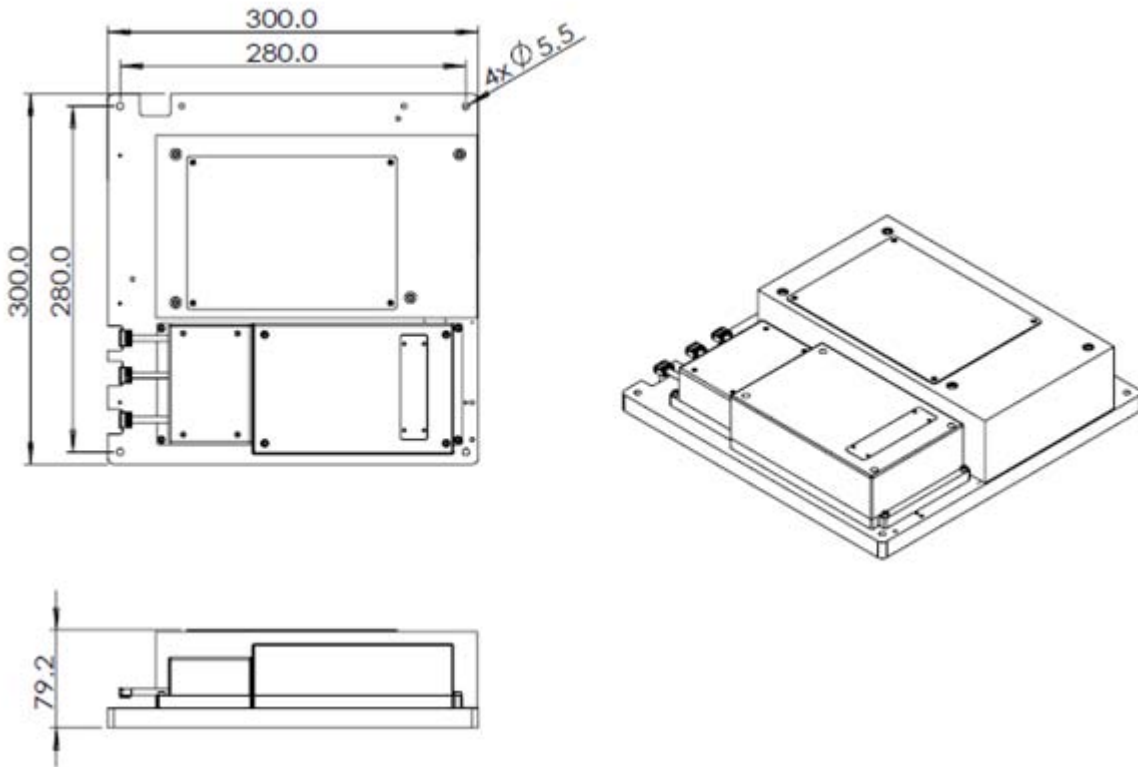
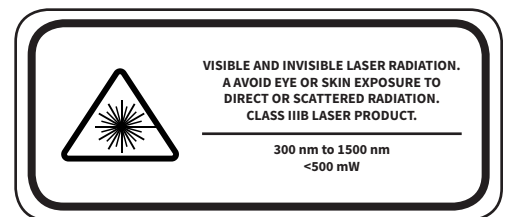


Figure1. Optical Deck Dimensions

This OEM laser does not comply with 21 CFR 1040.10 and 1040.11 without appropriate integration. Please contact Pavilion Integration Corp. for additional support or questions.

ISO9001 & ISO13485 Registered



Notes



**ADVANCED
R&D**

**VOLUME
MANUFACTURING**

**APPLICATIONS
DEVELOPMENT**

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