

## New Product Release | Focuslight Technologies Releases Miniaturized High-Power Diode Laser Stacks GS09 and GA03

Dec 13, 2023

Focuslight Technologies Inc. has proudly released two miniaturized high-power diode laser stacks: **GS09** and **GA03**.



Focuslight's Compact High-Power Diode Laser Stacks GS09 (top) and GA03 (bottom)

The emergence of high-power diode lasers can be traced back to the 1960s when they were initially employed in communication and sensing with relatively low power levels. In the 1980s and 90s, there was a gradual increase in the output power of high-power diode lasers, revealing potential applications across various fields. In the 21st century, continuous technological innovation has equipped high-power diode lasers with features such as **high output power, excellent heat management, and outstanding reliability, which enabled their wide utilization in various fields like industrial material processing, solid-state laser pumping, and scientific research.**

Solid-state laser pumping, an important application for high-power diode lasers, combines them with solid-state laser gain media to achieve powerful and controllable laser output. In recent years, as the field of solid-state lasers

continues to evolve, new applications have emerged. For example, using Nd:YAG as a laser crystal can achieve high-power 1064nm laser output (in CW or QCW mode), ultimately applied in precision materials processing, hard material cutting (such as diamond cutting, frequency doubled 532nm), surface treatment, and pan-semiconductor processing in advanced manufacturing fields. By using Ho/Tm/Er:YAG crystals or ceramics, "eye-safe" lasers in the wavelength range of 1.4~3  $\mu\text{m}$  can be obtained, with extensive application prospects in LiDAR ranging, communication, 3D imaging, or gated imaging. Lasers in the ~2  $\mu\text{m}$  wavelength range can also be applied in localized heating and precise cutting of various polymers (such as polymer plastics) and interface welding. Additionally, water molecules have a very high light absorption near ~2  $\mu\text{m}$ , so lasers in this wavelength range play a crucial role in medical applications (such as tissue cutting, hemostasis, and stone fragmentation in urological surgery).

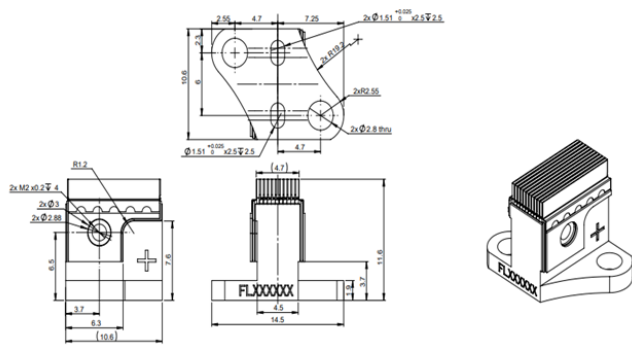
With the advancements of semiconductor chip technology and the continuous expansion of downstream applications, **high-power diode lasers for solid-state laser pumping are rapidly developing towards miniaturization.** As a significant development trend, miniaturization involves various technological innovations and optimizations. **Leveraging Focuslight's core technologies such as eutectic bonding, interface materials and surface engineering, and thermal management,** the new high-power diode laser stacks GS09 and GA03 achieve progress in integrated technology, improved design efficiency, enhanced heat management, and increased product reliability and lifetime.

Thanks to their compact design, adoption of advanced materials, and industry-leading eutectic bonding processes, GS09 and GA03 reduce the thermal resistance of the laser stacks while ensuring product reliability. **These stacks are ideal for solid-state laser pumping applications, enabling customers to design and manufacture smaller-sized products under the same output conditions or achieve higher power output within similar dimensions.** This advantage not only facilitates customer product and system integration but also helps further reduce costs, providing more compact and efficient photonics application solutions for various mid-to-downstream application fields.

**Product Features:**

**1. Miniaturized Design, Compact Dimension**

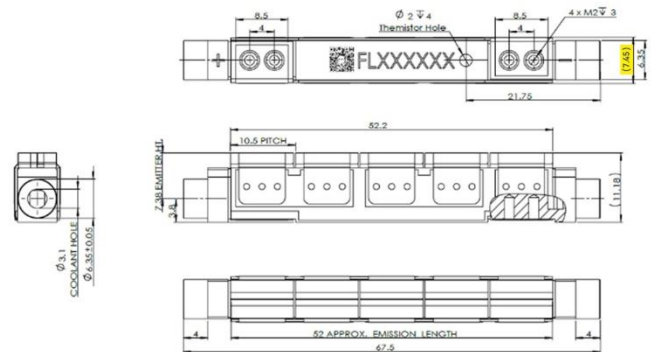
The GS09 reduces the chip spacing from the previous generation's 0.73mm to 0.43mm, significantly decreasing the width of the stacks' light-emitting area. Meanwhile, the number of chips in the stacks can be expanded to 10 bars, achieving a peak power output of up to 1000W.



Product Code	(Typical Customization)	
Part No. <sup>1</sup>	FL-GS09-10X1-1000-808-(Q)	
General Data	Unit	Value
Operation Mode	-	OCW
Pulse Width	us	200
Duty Cycle	%	1
Pitch	mm	0.43
Optical Data <sup>2</sup>		
Centroid Wavelength	nm	808
Wavelength Tolerance	nm	± 2
Output Power per Bar	W	100
Number of Bars	-	10
Spectral Width FWHM	nm	≤ 4
Spectral Width 90% Energy	nm	≤ 6
Fast Axis Divergence (FWHM)	°	35 (typical)
Slow Axis Divergence (FWHM)	°	8 (typical)
Polarization Mode	-	TE
Wavelength Temp. Coefficient	nm / °C	~ 0.28
Electrical Data <sup>3</sup>		
Operation Current	A	≤ 120
Threshold Current	A	≤ 20
Operating Voltage per Bar	V	≤ 2
Slope Efficiency per Bar	W / A	≥ 1
Power Conversion Efficiency	%	≥ 55
Thermal Data		
Operating Temperature	°C	-45 ~ 60
Storage Temperature <sup>3</sup>	°C	-55 ~ 85

GS09 Datasheet

Compared with the previous generation, the **GA03 significantly reduces the overall width from 18.2mm to 7.45mm** while maintaining the same single-bar output power of approximately 200W. The number of chips in the stacks can be expanded horizontally and vertically to form a 3x10 array (30 bars), achieving a maximum peak laser output of 6000W.

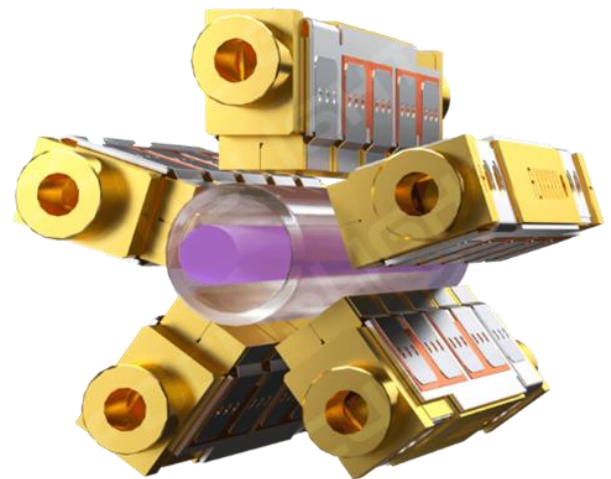


Product Code		(Typical Customization)
Part No.¹		FL-GA03-3X5-3000-808(O)
Test Temperature		25°C
General Data		Unit
Operation Mode	-	QCW
Pulse Width	us	300
Duty Cycle	%	5
Optical Data²		
Centroid Wavelength	nm	808
Wavelength Tolerance	nm	± 3
Output Power per Bar	W	200
Number of Bars	-	15
Spectral Width FWHM	nm	≤ 4
Spectral Width 90% Energy	nm	≤ 6
Fast Axis Divergence (FWHM)	°	35 (typical)
Slow Axis Divergence (FWHM)	°	8 (typical)
Polarization Mode	-	TE
Wavelength Temp. Coefficient	nm / °C	- 0.28
Electrical Data		
Operation Current	A	≤ 220
Threshold Current	A	≤ 40
Operating Voltage per Bar	V	≤ 2
Slope Efficiency per Bar	W / A	≥ 1
Power Conversion Efficiency	%	≥ 50
Thermal Data		
Operating Temperature	°C	25
Storage Temperature¹	°C	-55 ~ 85
Coolant	-	Distilled water
Flow Rate	L/min	2.5

GA03 Datasheet

application scenarios, making them ideal solutions in a wide range of application fields.

GA03 has previously been successfully applied in Focuslight's SP series high-power diode laser side pumped modules for solid-state lasers (DPSSL). The SP18, as a typical product, utilizes a 5 x 1-bar structure, achieving a peak pumping power output of up to 5kW, along with a 30-fold small signal gain (SSG) and excellent uniformity in fluorescence distribution (>90%). Its world-leading capabilities have earned it the 2023 Laser Focus World Innovators Awards.



2023 Laser Focus World Innovators Award Winning Products SP17 and SP18 (top), Their Five Phase Pump Structure (bottom)

## 2. Enhanced Heat Management, Extended Product Lifetime

Through the optimized design of the conduction structure, GA03 enables more efficient heat dissipation from the chips to the cooling water channel, achieving more effective heat exchange. This ensures the same output power in a more compact size while also extending the product's lifetime.

Both products are undergoing continuous lifetime testing and have achieved a pulse count of 10<sup>9</sup>.

## 3. Flexible Customization, Wide Application Potentials

Both products demonstrate excellent scalability, allowing flexible customization of the number of bars and output power based on customer requirements. They can be combined and configured differently based on customer

Both GS09 and GA03 are now in small-scale production and available for customer samples and small-batch orders.

Since its establishment, Focuslight has been dedicated to the research and development of fundamental photonics components and related application solutions. The company has independently developed core technologies and products in the fields of high-power diode lasers and laser optics – which now include eutectic bonding, thermal management, thermal stress control, interface materials and surface engineering, test analysis and diagnosis, line beam shaping, beam transformation, beam field homogenization and wafer-level synchronous structured laser optical manufacturing, with a highly experienced technical research and development team. Since 2012, Focuslight has continuously introduced high-power conduction-cooled stacks – GS series. **The newly launched GS09 and GA03 products have undergone iterative upgrades based on the previous generations, achieving industry-leading key capabilities such as miniaturization, heat management, and reliability. Leveraging its core technologies, Focuslight has successfully developed a series of high-power, highly reliable conduction-cooled stacks, with its motto “Never stop exploring”, dedicating itself to providing customers with more flexible and efficient tailor-made solutions.**

Focuslight strives to be the globally trusted photonics solution provider through innovation, manufacturing excellence, and fast response to fully unlock the potential of photonics to enhance and enrich people’s life!

#### About Focuslight

Focuslight is a fast-growing company that develops and manufactures high-power diode laser components and materials (photon generation), laser optics (photon control), photonic application modules, assemblies, and sub-systems (photonics application solutions) with a focus on automotive, pan-

semiconductor, and medical & health application solutions. With our extensive engineering expertise and know-how, Focuslight is dedicated to providing customers with well-matched comprehensive solutions that enable our customers’ success in their own businesses. In December 2021, Focuslight announced the IPO on the Shanghai Stock Exchange (Ticker Symbol: 688167). [Focuslight – Never Stop Exploring \(www.focuslight.com\)](http://www.focuslight.com)