1535nm Erbium Glass High Repetition Frequency Diode Pumped Solid State Laser

1 PRODUCT DESCRIPTION

The High Repetition Frequency 1535 nm laser developed and manufactured by ERDI adopts self - developed erbium laser glass and mature bonded - body packaging technology (bonded crystal based on Er: glass and Co: spinel), so it is also known as the 1535 nm micro - chip laser. This laser is Class 1 eye - safe. Because the 1535 nm laser is more easily absorbed by the human eye compared to other lasers, such as the 1064 nm Nd:YAG laser. Currently, our High Repetition Frequency offers a pulsed laser energy of 5 - 70 μJ and a frequency range of 500Hz - 5kHz. Lighter in weight and smaller in size, the 1535 nm laser operates in the infrared range and is widely used as the laser light source for lightweight LiDAR sensors and laser rangefinders.

2 TECHNICAL SPECIFICATIONS

Model	ER10	ER20	ER50	ER70
Wavelength	1535 nm			
Eyesafe	Class 1			
Pulse energy	≥10 μJ	≥20 μJ	≥50 μJ	≥70 μJ
Laser Pulse width	5 ns	5 ns	4 ns	4 ns
Drive pulse width	≤ 0.3ms	≤ 0.3ms	≤ 0.4ms	≤ 0.4ms
Pulse repetition rate	5KHz	2.5KHz	1KHz	500Hz
Pulse stability	10%			
Directivity	<0.2°			
Raw Beam Diameter	0 .2 mm			
Beam divergence angle	＜15 mrad			

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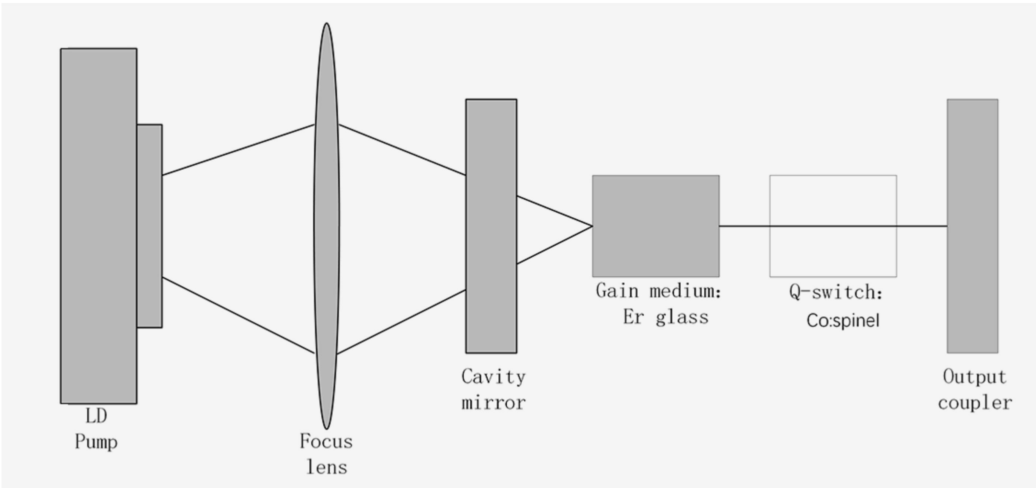
Beam Mode	TEM00
Operating temperature	-45 ℃~+65 ℃
Storage temperature	-55 ℃~+85 ℃
Dimension (mm)	17×8×7
Weight	6 g
Voltage	2 V
Electric current	5 A
Impact	1500 G, 0 . 5 ms
Vibration	20~2000 Hz/20 G
Service life	＞5 million times



3 OUTLINE DIMENSION(mm)

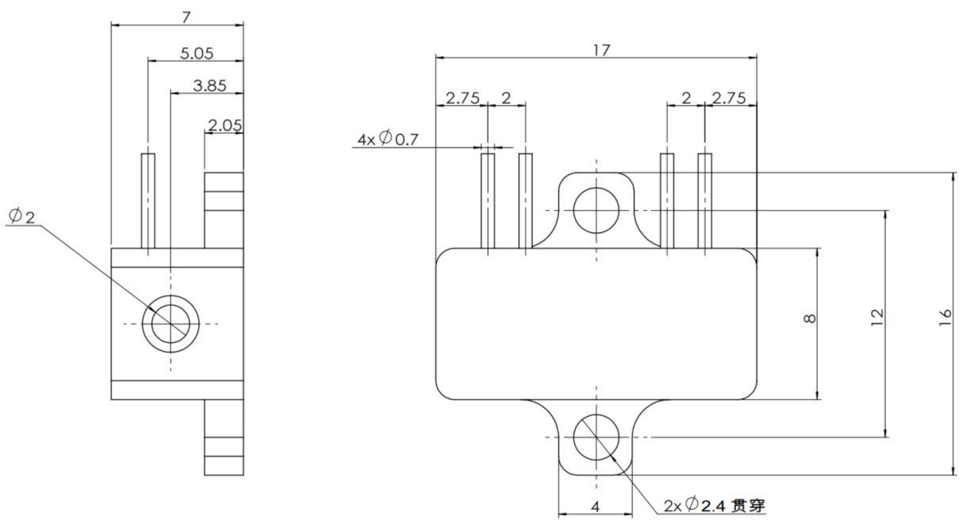


Figure 1 Outline Dimensions

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4 BRIEF INTRODUCTION TO THE PRINCIPLE

I. Basic Composition and Pumping Mechanism
The LD (Laser Diode) pumped erbium-doped glass laser is a solid-state laser that uses erbium-doped (Er^{3+}) glass as the gain medium and a semiconductor laser as the pumping source. Its core working principle is as follows:

Pumping Source: The laser diode (LD) emits light of a specific wavelength (usually 940 nm). It excites the erbium ions to the metastable high-energy level through direct absorption or indirect energy transfer.

Gain Medium: During the stimulated emission process, the Er^{3+} ions in the erbium-doped glass transition from the $^4I_{13/2}$ energy level to the ground state ($^4I_{15/2}$), releasing laser light with a wavelength of approximately 1.535 μm.

Resonant Cavity: It is composed of a high-reflectivity mirror and a partially reflective mirror. Through multiple reflections, it amplifies the photons and forms a coherent laser output.

II. Characteristics of the Eye-Safe Wavelength Band

The output wavelength of the erbium-doped glass laser is around 1.5 μm, which falls within the near-infrared wavelength band. This wavelength is classified as "eye-safe" (Class 1M) according to international standards. Because the photon energy at this wavelength is relatively low, and it is easily absorbed by the anterior structures of the eyeball (such as the cornea and the lens), it can avoid causing damage to the retina. It is particularly suitable for applications in open environments.

5 TECHNICAL ADVANTAGES

I. Compactness
The LD pumping technology is characterized by its small size and long lifespan, making it suitable for integration into portable devices.

II. Narrow Pulse Width
Combined with the passive Q-switching technology, it can generate nanosecond-level pulses, with peak powers reaching the kilowatt to megawatt range, meeting the requirements for long-distance ranging.

III. Environmental Adaptability
The 1.5μm wavelength band has a low transmission loss in the atmosphere (especially with strong penetrability in foggy and rainy environments), and it also has excellent resistance to background light interference.

6 APPLICATIONS OF LASER RANGING

I. Basic Principle
Laser ranging is based on the Time of Flight (ToF) method: a laser pulse is emitted towards the target, and the time difference of its reflected echo is measured.

II. System Composition
Transmitting end: The LD - pumped erbium - doped glass laser generates high - energy, narrow - pulse (nanosecond - level) laser, which is collimated by an optical system and then emitted.

Receiving end: An InGaAs/APD detector (matched to the 1.5μm wavelength) is used to receive the echo signal. A high - sensitivity circuit (such as a transimpedance amplifier) processes the weak signal.
Time measurement unit: A time - to - digital converter (TDC) or a high - speed counter is used to achieve picosecond - level time resolution, ensuring centimeter - level ranging accuracy.

III. Key Technical Parameters
Pulse width: The narrower the pulse width (e.g., a few nanoseconds), the more accurate the time measurement and the higher the ranging resolution (up to centimeter - level).

Peak power: High power (kilowatt to megawatt level) can improve the long - distance detection ability (typical range: hundreds of meters to tens of kilometers).
Repetition frequency: A high repetition frequency (kHz level) supports rapid and continuous ranging, suitable for dynamic target tracking.

IV. Application Scenarios
Military field: It is used in the fire - control systems of tanks and warships, as well as handheld rangefinders, ensuring safety and concealment. The miniaturized design of LD pumping supports the lightweight of equipment, making it suitable for mobile platforms such as drones, for example, micro - and small - sized electro - optical pods.

Topographic mapping: Airborne/spaceborne LiDAR systems use erbium - doped glass lasers to obtain high - precision three - dimensional maps.

Industrial inspection: It is used for the structural monitoring of bridges and buildings, or for obstacle ranging in robot navigation.






Microjoule-level products: They are small in size and light in weight, making them convenient for modular integration with the circuit boards of micro and small rangefinders.

Millijoule-level products: They have large single-pulse energy and high peak power, and are suitable for long-distance ranging equipment over 15 kilometers, such as miniaturized electro-optical pods.

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