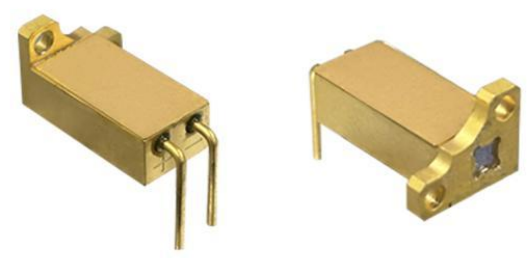
ERDI LASER®

1.54μm Erbium Glass Microchip DPSS Laser

1 PRODUCT DESCRIPTION

ERDI's newly launched MINI-type 1535nm erbium-doped glass laser uses co-doped Er:Yb phosphate glass and a semiconductor laser pump source. It is a Class 1 eye-safe laser, with dimensions of only 14.5×6.3×4.37 mm³ and a weight of 2.5g. The pulse energy is ≥100μJ, and the pulse repetition rate is 1-10Hz. It is widely used in laser ranging and lidar.



2 TECHNICAL SPECIFICATIONS

Model	MINI-100
Wavelength	1535 nm
Eye safe	Class 1
Pulse energy	≥100 μJ
Laser Pulse width	3.5 ns
Drive pulse width	≤ 1ms
Pulse repetition rate	1~10Hz
Pulse stability	10%
Raw Beam Diameter	0 .3 mm
Beam divergence angle	≤ 10 mrad
Beam Mode	TEM_{00}
Operating temperature	-40 ℃ ~ +65 ℃
Storage temperature	-55 ℃ ~+ 85℃
Dimension (mm)	14.5×6.3×4.37 mm³
Weight	2.5 g
Voltage	2 V

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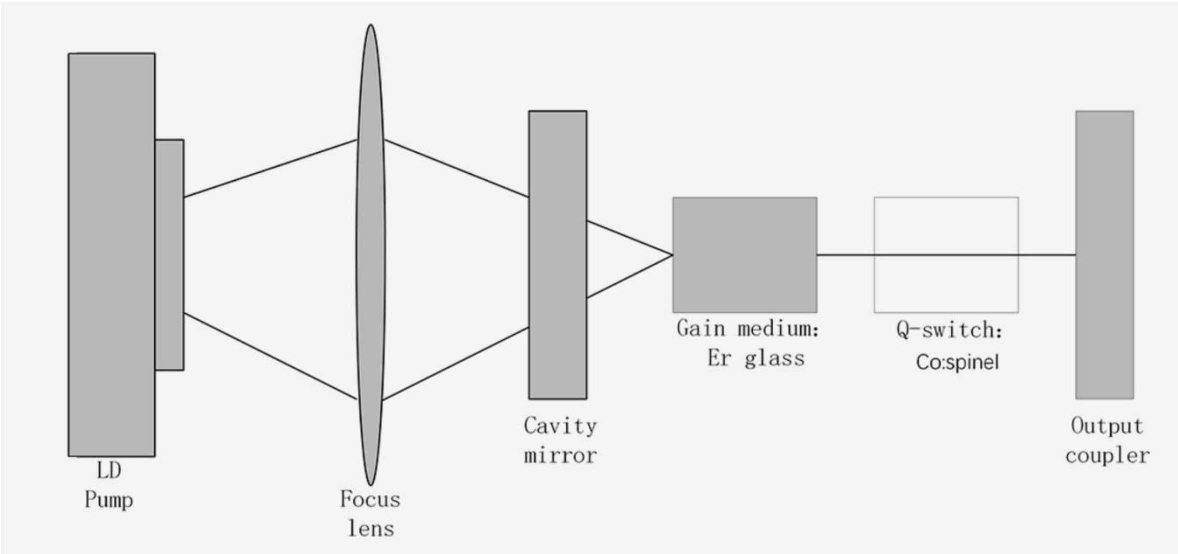
Electric current	12 A
Impact	Meets MIL-STD-810G test standards (1500 G, 0.5 ms)
Vibration	Meets MIL-STD-810G test standards (20~2000 Hz/20 G)
Service life	≥10 million times



3 OUTLINE DIMENSION(mm)

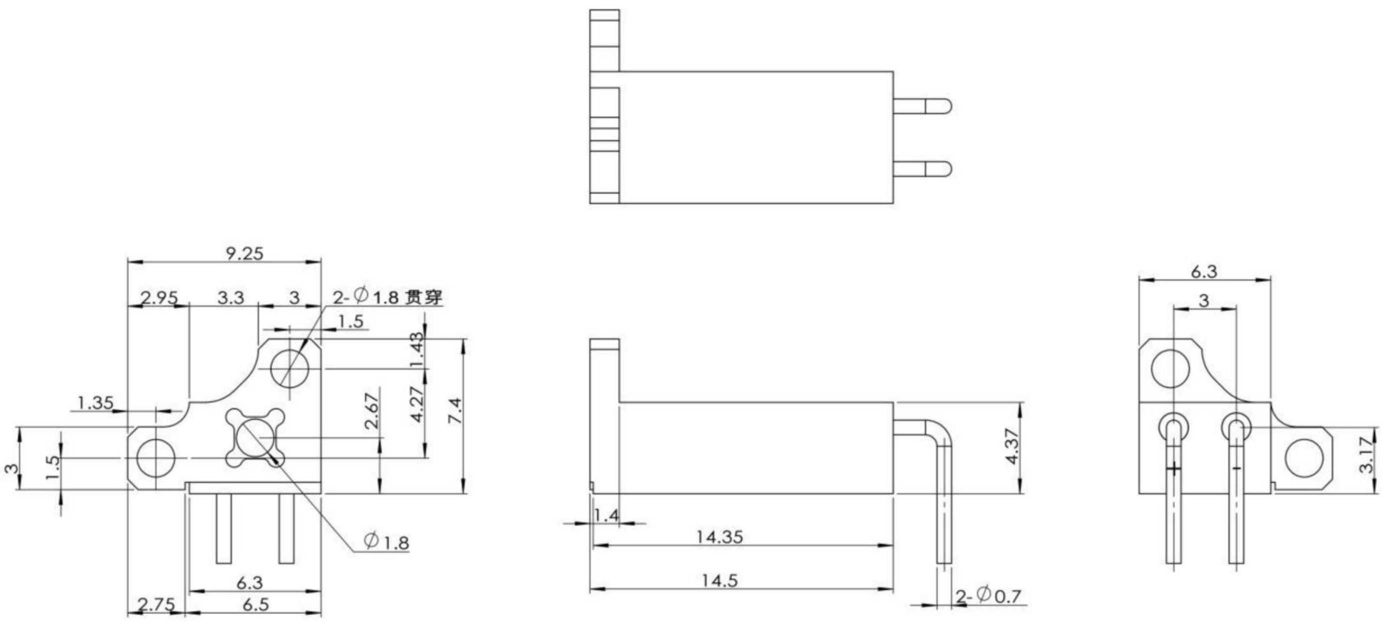


Figure 1 MINI-100 Outline Dimensions

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.