Snake Creek Lasers

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A Note About Proper Heatsinking of MicroGreen™ and MiniGreen™ Lasers

The Need for Heatsinking:

Diode-pumped miniature green lasers such as the Snake Creek Lasers MiniGreen™ and MicroGreen™ devices have a smaller efficiency than the red semiconductor diode lasers they are meant to replace (for the same power output green lasers are about 7 times brighter in daylight conditions and over 20 times brighter at night). To produce the same power output power the miniature green devices must use higher power pump diodes, typically up to 500 mW for the 5.6 mm package (MicroGreen™) and 2000 mW for the 9 mm package (MiniGreen™). Pump diodes dissipate approximately 65-70 % of their electrical input power as heat. For a 1 W pump diode for example with a typical efficiency of 30 %, 3.33 W of electrical input power is needed and 2.33 W of heat must be dissipated. Since neither the 5.6 mm and 9.0 mm TO packages were designed for the operation of high power laser diodes, good heatsinking is essential to insuring long diode lifetime. Because of this the 5.6 mm and 9 mm packages must be heatsunk in such a way as to effect the efficient removal of heat. In addition, all Snake Creek lasers are tested in the factory in a Snake Creek designed heatsink and held at a constant temperature by placing the heatsink on a thermoelectric cooler and using feedback from a 10 kΩ thermistor. In order for customers to obtain the same performance we recommend that the user purchase the Snake Creek 5.6 mm (SCL-HS-5.6MM) heatsink or the 9.0 mm heatsink (SCL-HS-9.0MM). These heatsinks allow the user to safely operate the 5.6 mm and 9.0 mm green laser products and duplicate the factory test results. The heatsinks allow the entire rear (heat removing) plane of the green laser to be placed in contact with the heatsink and facilitate the removal of heat from between the three diode pins where most of the heat is generated. The holes provided for the pins are designed to allow the laser to sit flush with the heatsink plane.

It should be pointed out that if users of these miniature green lasers decide to provide their own heatsinking solutions, the area of the back plane of the laser between the pins that contacts the heatsink must be heatsunk for the 9 mm MiniGreen™ lasers. It is recommended that the same strategy be used for cooling the 5.6 mm MicroGreen™ lasers. If users do not follow this important rule, the 9.0 mm MiniGreen™ laser may burn out or have dramatically reduced output power. Lasers that are not properly heatsunk void Snake Creek's warranty. Heatsinking the barrel rather than the backplane of the 5.6 mm MicroGreen™ lasers will work, but at substantially reduced output power. Please contact Snake Creek Lasers if heatsinking questions arise for your application.

Temperature Stabilization and Noise:

MicroGreen™ and MiniGreen™ devices are diode-pumped frequency-doubled solid-state lasers that utilize small Nd doped vanadate/KTP crystal assemblies. They lase in a single-transverse mode (TEM_{00} or Gaussian) and typically in two or three longitudinal modes. Fluctuations in the green output power from longitudinal mode beating occurs and is referred to in the industry as "the green problem". If the fluctuations are rapid as they are in our green lasers, the green output beam does not fluctuate visually. These types of lasers display regions where the longitudinal mode beating vanishes or is minimized by tuning the input current to the diode. For users needing low noise performance, we recommend placing the green laser on an Snake Creek heatsink that is mounted on a thermoelectric cooler (TEC) and with a 10 kΩ thermistor for stabilizing the heatsink temperature. Any commercial TEC controller will work. By tuning the temperature of the heatsink and/or tuning the current to the laser, MicroGreen™ and MiniGreen™ devices can be operated in the low-noise regime where mode-beating is virtually absent.