TECH NOTE

Heat Load and Temperature Capability of the LDM-4415

PURPOSE

This technical note illustrates the minimum temperature achievable for a given thermal loading and coolant water temperature for the LDM-4415 laser diode mount.

BACKGROUND

The LDM-4415 laser diode mount was developed specifically for the CS package laser.
To effectively control the temperature of the device, two thermoelectric coolers (TECs) are wired in series beneath the device mounting surface (hotplate). The heat generated by the TECs is then removed through the use of a compact liquid cooled coldplate. When the LDM-4415 is supplied with the correct power and cooling water, heat loads of 100W can be accurately controlled down to 18.5°C.

MEASUREMENT SETUP

Testing was performed in a typical laboratory environment at 20°C. Plant water at a constant 14°±1°C, flow rate of 2.3 Lpm, and pressure of 345 kPa (50 psi) was used to cool the mount throughout testing. All temperature measurements were taken with a calibrated 10 kΩ thermistor embedded within the LDM-4415 hotplate. The thermistor is accurate to +/-0.2°C with a temperature range of -20° to 50°C.

The setup for the first test is shown in Figure 1. An LDX-3670 high power laser diode current source supplied current to a resistive load on the LDM-4415 hotplate. An LDT-5980 high power temperature controller was used to control the temperature of the mount. The controller was set at the maximum 12V and 10A limits. Heat loads of 20W -100W in 20W increments were applied to the hotplate. A minimum temperature was reached and held for 2 minutes at each power increment.

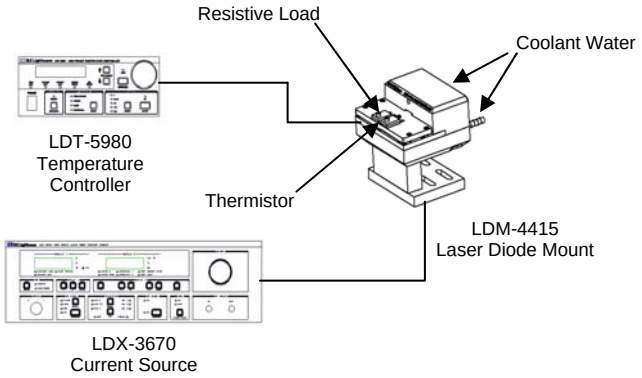

Figure 1

A second test utilized a higher capacity 30V power supply to find the voltage necessary to dissipate a 100W thermal load at the lowest possible temperature. The setup for this test is shown in Figure 2. A constant heat load of 100W was applied to the hotplate. The voltage supplied to the TECs was increased from 10V to 28V, which is the maximum allowable voltage for the TECs.

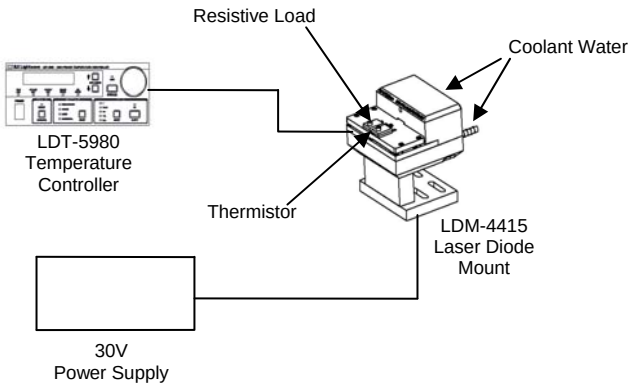

Figure 2

ILX Lightwave
Photonic Test and Measurement

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RESULTS

The results from the first test using the LDT-5980 are shown in Figure 3 as a plot of temperature versus thermal load. As seen on the plot, an operating temperature of 7.8°C at 75W and 18.5°C at 100W can be maintained. Use of the LDM-4415 with water above or below 14°C will result in different operating temperatures.

LDM-4415 Mount with LDT-5980 Controller

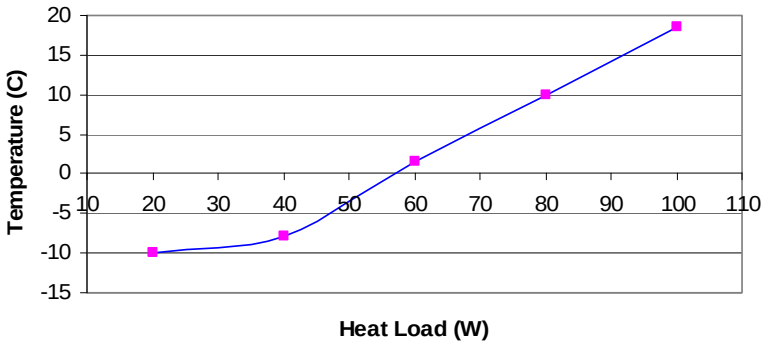

Figure 3

The results of the second experiment shown in Figure 4 demonstrate that the highest TEC drive power does not result in the lowest load temperature. It can be seen on the plot that at approximately 25V, the minimum temperature of 9.7°C is reached.

Beyond 25V, the liquid cooled coldplate does not remove heat from the hot side of the TECs as fast as it is generated, resulting in a temperature increase of the hotplate and device. More information on this relationship can be found in the ILX application note #14 *Optimizing TEC Drive Current*.

LDM-4415 Mount with 30V TEC Power Supply and 100W Heat Load

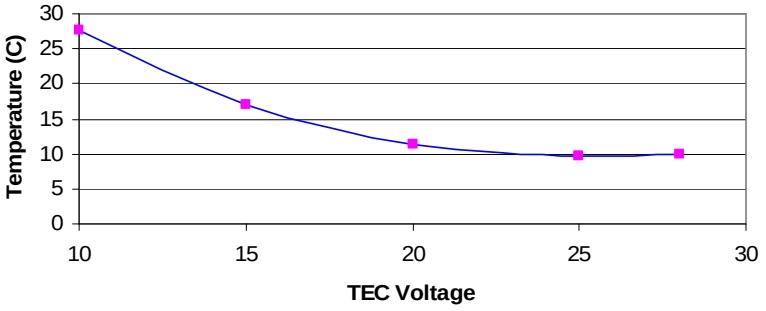

Figure 4