TECHNICAL NOTE

LDT-5900C AND LDC-37X6 SERIES TEMPERATURE STABILITY
TN#5910C-1

This technical note illustrates the temperature control stability achieved by the LDT-5910C and LDT-5940C Thermoelectric Temperature controllers. Due to the same design techniques employed in our LDC-37X6 series of laser diode controllers, the test conditions and results of the LDT-5910C apply directly to the TEC portion of our LDC-3726 low power laser diode controller. Similarly, the LDT-5940C results apply directly to the TEC portion of our LDC-3736 and LDC-37620 high power laser diode controllers.

Test Set Up

An LDT-5910C and LDT-5940C were each in turn connected to the TE-550 Case Temperature Control of an LDM-4984 Butterfly Laser Diode Mount. An aluminum test load with two adjacent calibrated thermistors was clamped to the mounting pad of the LDM-4984.

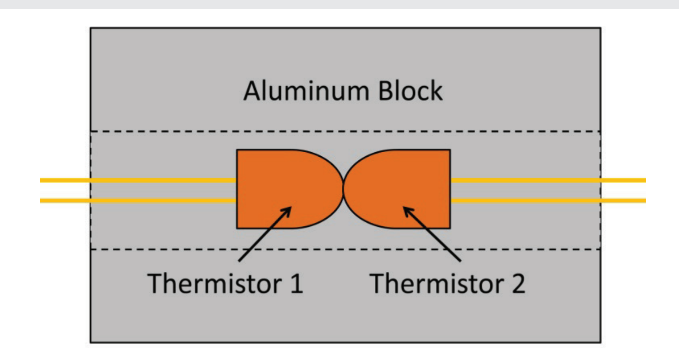

Figure 1: An internal view of the test load that shows the adjacent thermistors encased in the aluminum test load.

Thermistor 1 was used as the temperature feedback sensor for the LDT-5910C/LDT-5940C and Thermistor 2 was measured with a Hewlett Packard 3458A 8 ½ Digit Multimeter. The test load was covered with the LDM-4984 ESD protection cover to minimize air flow. To further isolate the test load from environmental fluctuations, a two inch layer of foam packaging material was placed over the ESD cover and secured to the mount. The test setup is shown in Figure 2.

A third calibrated thermistor, Thermistor 3 (see Figure 2), was placed near the test load to record the environmental temperature and was measured with an Agilent 34401A 6 ½ Digit Multimeter.

TEST PROCEDURE

The resistances of Thermistor 2 and Thermistor 3 were measured every sixty seconds for 25 hours. Recording 25 hours of measurements provides data for both the 1 hour initial warm-up period as well as the 24 hour period. The resistance data was converted to temperature data using the specified Steinhart-Hart constants for each thermistor. The temperature stability figure was calculated by subtracting each temperature measurement from the average temperature over the second hour.

RESULTS

A graph of the temperature stability of the LDT- 5910C is displayed in Figure 3 and that of the LDT-5940C is found in Figure 4.

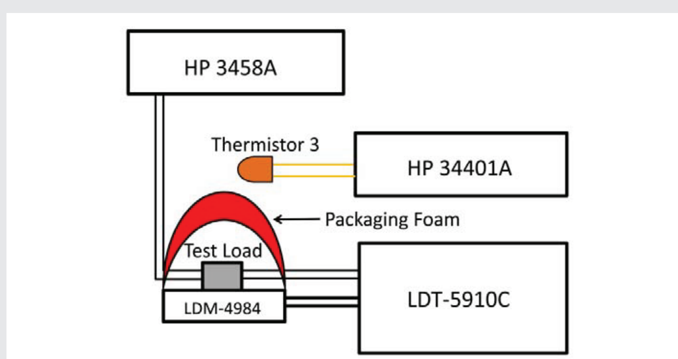

Figure 2: The temperature stability test setup.

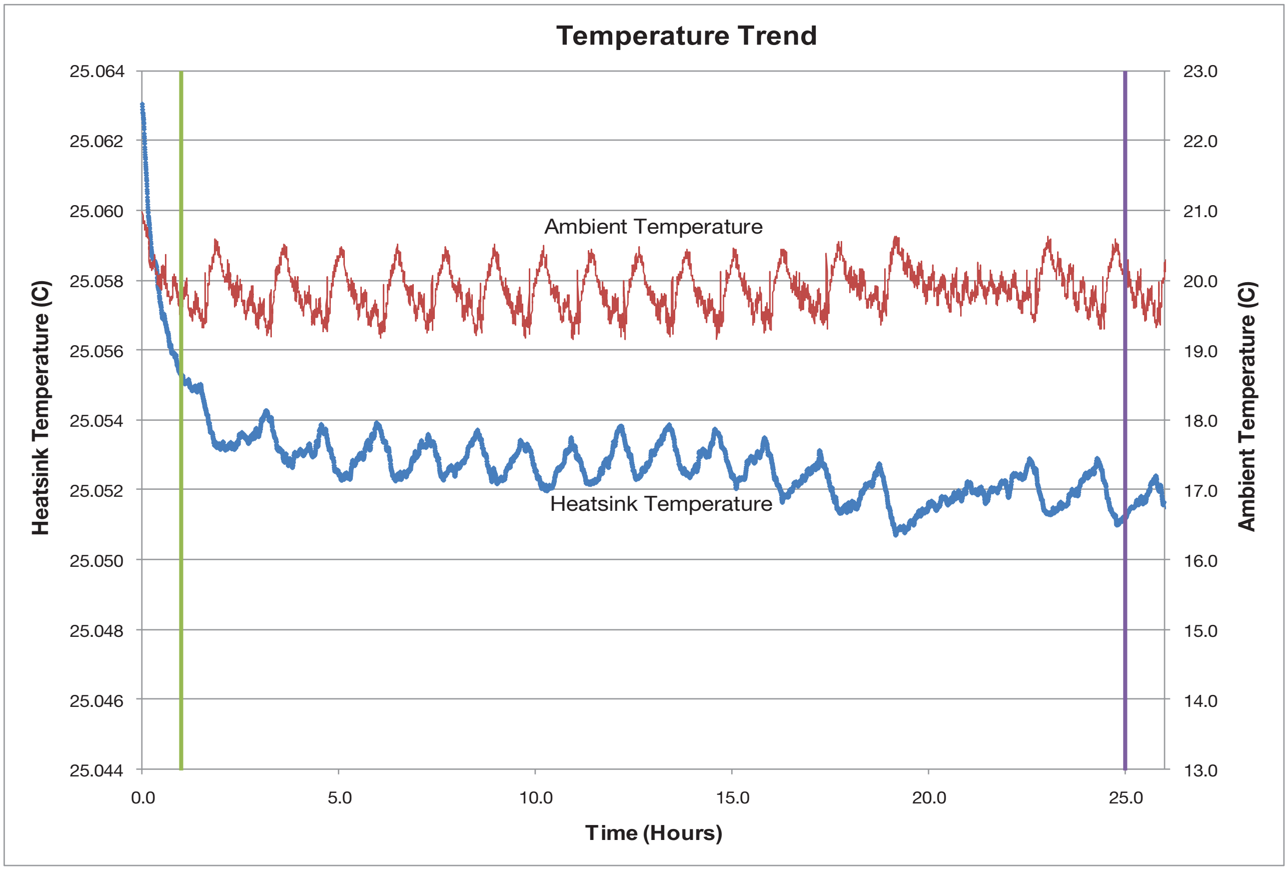

Figure 3: LDT-5910C stability results

This graph is a plot of the ambient temperature of the testing room and the stability of the LDT- 5910C. The green line indicates a one hour warm-up. The purple line indicates 24 hours beyond the one hour warm-up.

During the course of the tests, the room temperature peaked at 0.5 °C above the average.

The change in the room temperature had some affect on the temperature of the aluminum test load controlled by the LDT-5910C. The test load temperature had a peak of 0.002 °C above the average and -0.0018 °C below the average.

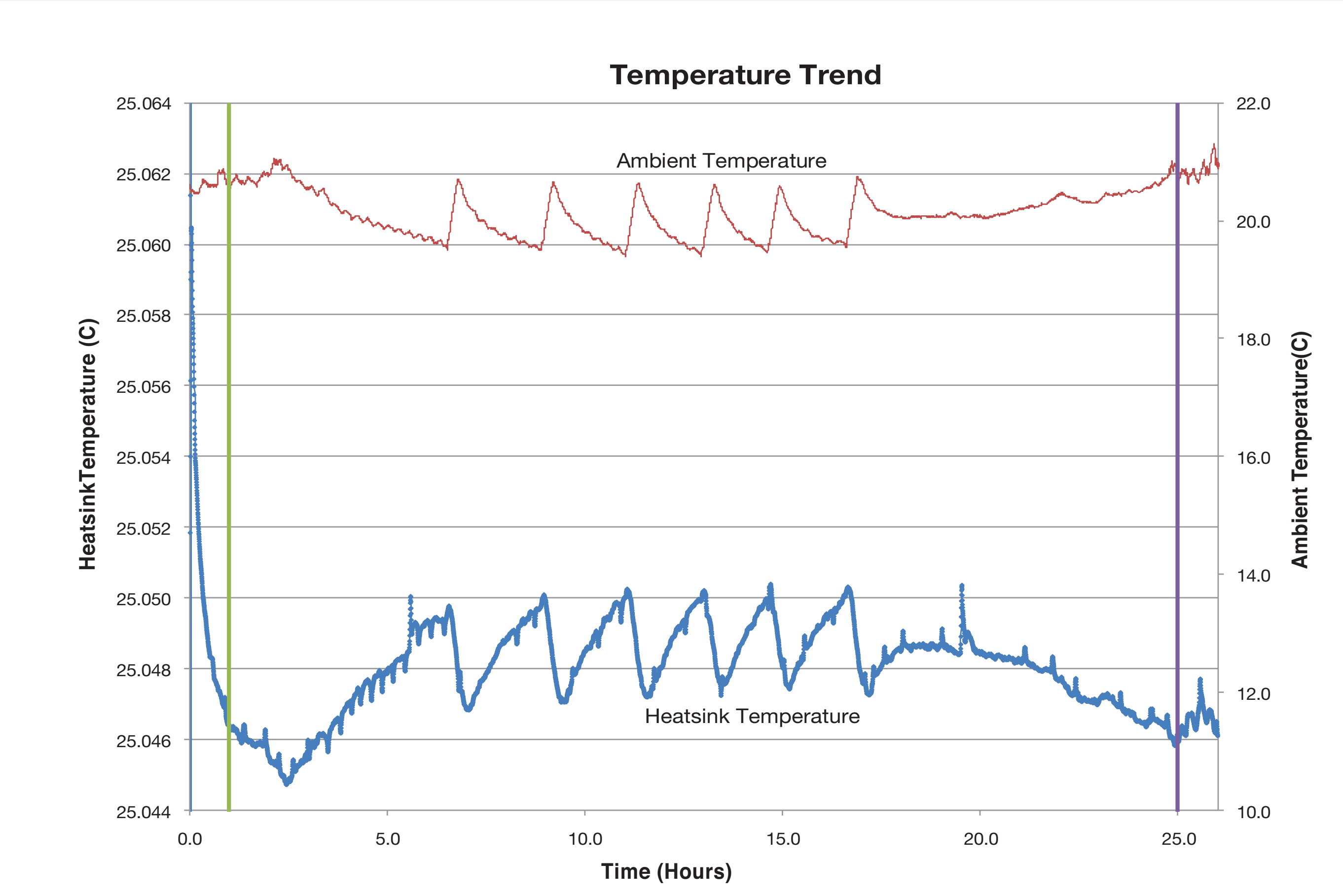

Figure 4: LDT-5940C stability results.

This graph is a plot of the ambient temperature of the testing room and the stability of the LDT- 5940C. The green and purple lines again reflect a one hour warm-up and a 24 hour point.

The room temperature again peaked at about 0.5 °C above the average. The test load peaked at 0.0027 above the average and .0028 °C below.

Conclusion

The LDT-5910C High Power Thermoelectric Temperature Controller controlled the temperature of the test load to within ±0.0019 °C, which is within the published specification for long term temperature stability of ±0.002 °C. Similarly, the LDT-5940C High Power Thermoelectric Temperature Controller controlled the load to within ±0.0028 °C, again meeting the specification of ±0.003 °C in this case.

For fine temperature control of thermal masses considerably smaller than this tech note test condition (such as the thermoelectric cooling of an on-chip TEC of a laser diode package), it is recommended to use a lower power thermoelectric temperature controller, such as our ILX Lightwave LDT-5416.

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