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Using the LDM-4984 with the LDP-3840B Pulsed Current Source

OVERVIEW

In order to obtain low overshoot with good pulse shapes, the ILX Lightwave LDP-3840B Pulsed Current Source uses an external laser diode mounting board, LPB-380 to improve impedance matching. The nominal output impedance of the LDP-3840B is 3Ω; the LPB-380 uses tuning resistors to match the output load to the 3Ω of the LDP-3840B. The standard configuration for the LPB-380 is five 1Ω resistors in parallel that give an effective tuning resistance of 0.2Ω on the output.

While pulse shapes improve with this arrangement, connecting the LDP-3840B to an ILX standard laser diode mount becomes difficult. This technical note will explore different approaches to connecting a standard LDM-4984 to an LDP-3840B while optimizing the pulse shape.

TEST SETUP

A standard LDM-4984 was used with a NEL 20 mW DFB butterfly laser diode. The laser diode was temperature controlled using an ILX Lightwave LDT-5525 with a setpoint temperature of 25°C. The output from the butterfly laser diode was measured using a THORLABS PDA400 amplified InGaAs photodiode connected to a Tektronix TDS 3032 oscilloscope.

TEST PROCEDURE

The LDP-3840B was used with the LPB-380 Laser Diode Mounting Board and connected in two different configurations to the LDM-4984. First, a DB-9 connector was soldered to the LPB-380 with very short leads. This was done to allow direct connection to the laser connector on the LDM-4984. The second approach involved using short leads and directly connecting them to the leads of the butterfly laser diode package. This was achieved by placing the short leads directly on top of the corresponding laser diode pins and using the mount ZIF sockets to secure the connection. The LDP-3840B was set up to output a 100 mA pulse with a pulse width of 5 us.

For all experiments, the LDP-3840B was allowed to warm up for a period of one hour.

RESULTS

The image in Figure 1 is the output from the amplified photodiode with all five matching resistors on the LPB-380 (standard configuration) which gives an effective tuning resistance at the output of the LPB-380 of 0.2Ω.

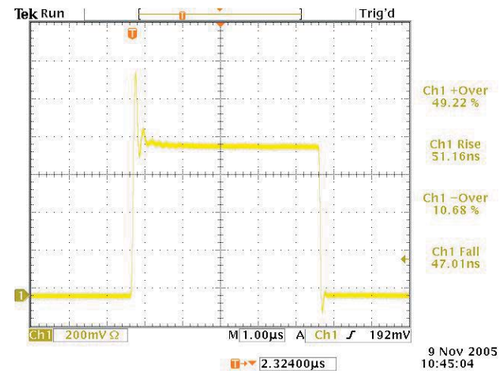


Figure 1

The image in Figure 2 was taken with the standard configuration but the laser anode and cathode wires in the LDM-4984 were twisted to minimize inductance. Notice how the positive overshoot drops from 49.22% (in Figure 1) to 37.72% (in Figure 2) by this simple change in setup.

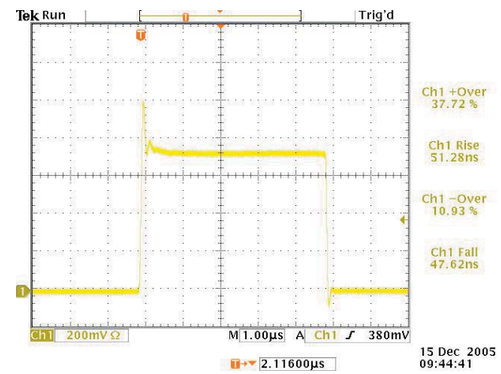


Figure 2

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Figure 3 shows the change that results when the effective tuning resistance is increased to 1 by removing four resistors from the LPB-380.

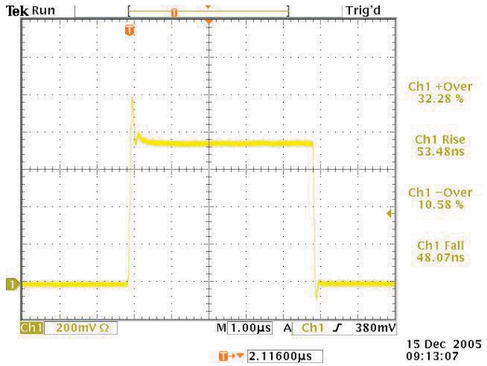


Figure 3

Increasing the tuning resistance to 4 (five 20 resistors in parallel) the positive pulse overshoot drops to 22.88% (in Figure 4). The problem with adding additional resistance is the increase in rise and fall time of the pulse.

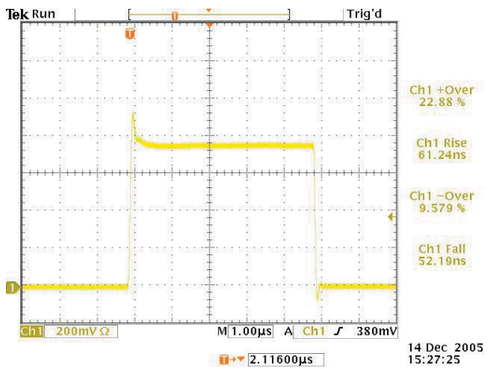


Figure 4

Figures 5 - 7 show the results of connecting the LPB-380 output directly to the pins of the laser package. The tuning resistance was set back to the standard configuration of 0.2W (in Figure 5).

The tuning resistance was then set to 1Ω (in Figure 6). It is interesting to note in this configuration there does not appear to be any change in positive pulse overshoot. The only change between Figure 5 and 6 is the lower negative pulse overshoot in Figure 6. With a 4Ω tuning resistance on the LPB-380, Figure 7 shows a decrease in positive pulse overshoot to 14.96% but at the expense of rise time.

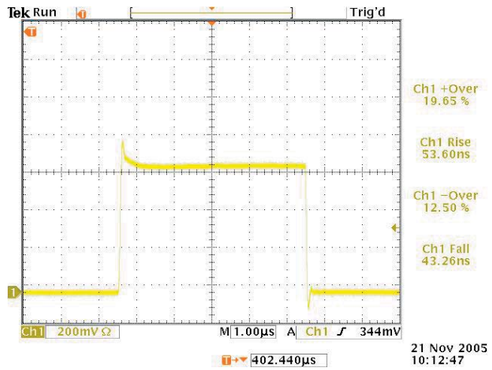


Figure 5

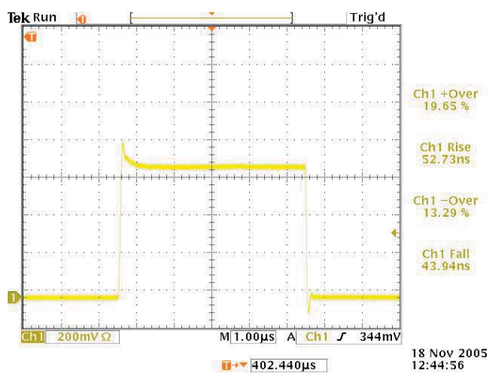


Figure 6

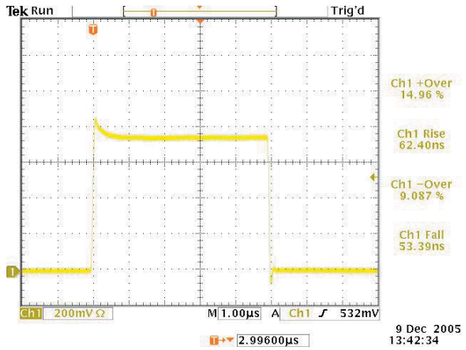


Figure 7

CONCLUSIONS

The LDP-3840B does not offer a convenient way to easily connect to ILX Lightwave's standard LDM-4984 butterfly laser diode mount while maintaining optimal pulse performance. The results offered here give an indication of the typical results you may expect when trying to pulse a laser diode in this configuration. It was interesting to note the drastic change between positive pulse overshoot in directly connecting the LPB-380 laser diode mounting board to the LDM-4984 and connecting the LPB-380 directly to the laser diode. This improvement on overshoot is attributed to bypassing the internal wiring of the LDM-4984, thus shortening the leads from the LPB-380 board to the laser diode.

While the LDP-3840B laser diode mount and the LDM-4984 were not designed to work together for optimum pulse characteristics, this technical note has described two convenient ways to connect the LDP-3840B to the LDM-4984. It should be noted that by further reducing the lead lengths from the LPB-380 to the laser, it may be possible to achieve better pulse overshoot performance.

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Figure 3 shows the change that results when the effective tuning resistance is increased to 1 by removing four resistors from the LPB-380.

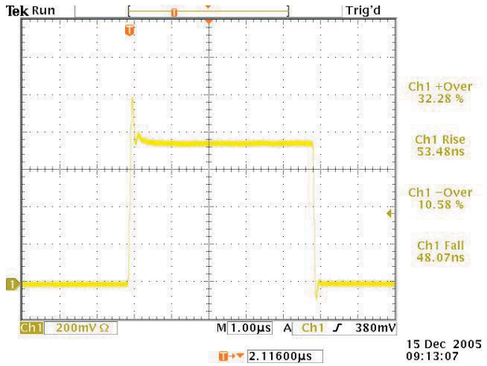


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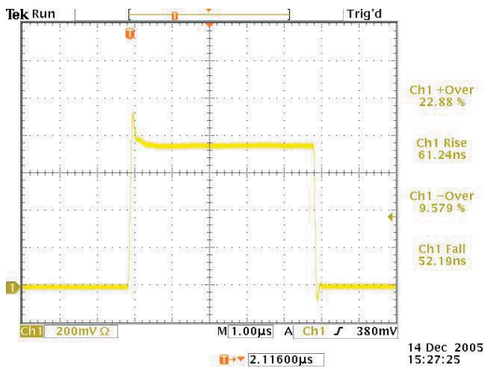


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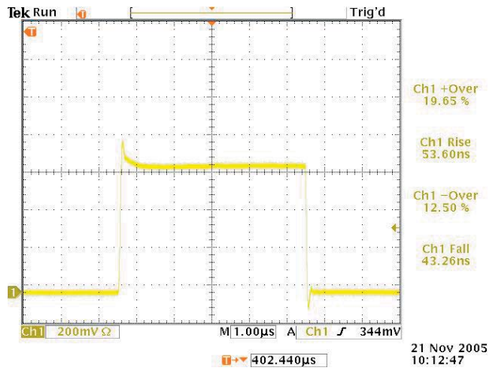


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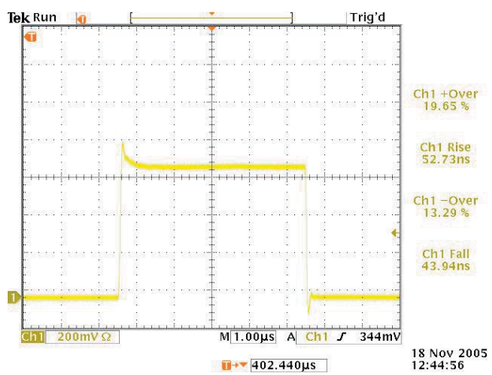


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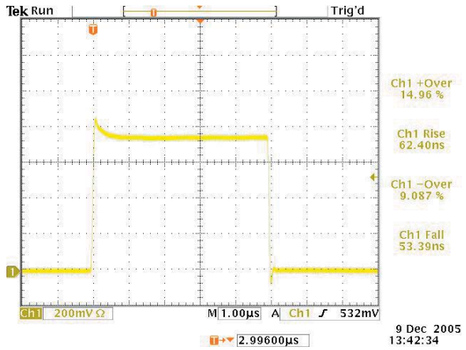


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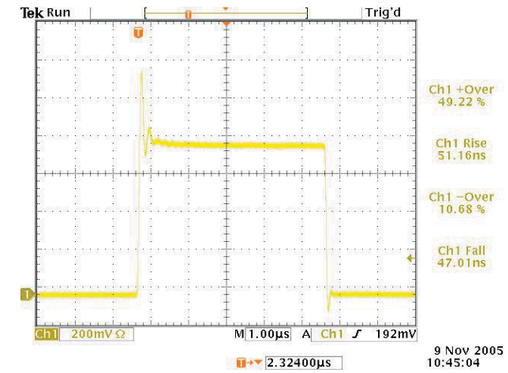


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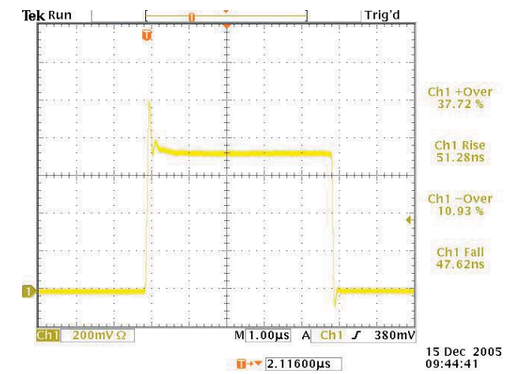


Figure 2

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