Laser diodes are sensitive to ESD, rapid turn-on currents, and overvoltage conditions. To address those problems, the simple laser-diode controller in Figure 1 has several functions. The first part of the circuit comprises an 8.2V zener diode, $D_1$ that forms the heart of a constant-voltage source for the laser diode. Next, IC$_{1A}$, half of a dual FET-input op amp, forms an inverting integrator to slow the turn-on time. To turn on the laser diode, IC$_{1B}$, the other half of the op-amp IC, triggers the base of $Q_2$. This transistor forms a constant-current source for the laser diode. You can monitor the laser-diode supply voltage and the sense-diode current and voltage. You use these parameters as inputs to the differential amplifier, IC$_{2A}$, the first half of another dual FET-input op amp. When an overvoltage condition occurs, the difference amplifier detects the condition, and its output drives IC$_{2B}$, configured as an open-loop comparator. You set the threshold by using the potentiometer, $R_1$. Zener diode $D_2$ provides a constant-voltage source for that threshold setting. When the voltage reaches the threshold, the output triggers the base of $Q_1$, which instantly shuts down IC$_{1B}$, which in turn shuts down the laser diode.

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