



The picture on the left shows the front and back of each of the 3 circuit boards that make up the IEEE-1394 (a.k.a. Firewire) camera that Dr. Joyce designed and built for LC Technologies, Inc. The three boards are (top to bottom) the main circuit board, the power board and the sensor board.

On the main circuit board, an ADC microcontroller has overall control, a Xilinx FPGA defines the data paths, an S-DRAM provides buffering and Texas Instruments 1394 controller chips implement the 1394 protocol. The microcontroller, along with a Windows program, implements in-circuit reprogrammability using the JTAG protocol over the 1394 channel. The FPGA functionality was defined using VHDL. The camera adheres to the DCAM spec.

The power board steps the 1394 voltage down to 5, 3.3 and 1.8 volts. It can be run from the 1394 bus power or powered by an external supply (in case the camera is attached to a laptop, most of which do not supply power to their 1394 buses). It was over-spec'ed for a peak of about 12 watts, while the camera only draws about 3 watts.

The sensor board is based around a Micron 1.3 megapixel CMOS sensor. It also contains circuitry for an external pulsed LED illuminator.

Dr. Joyce was responsible for the entire design, from the choice of components to the schematic design to the PCB layout, as well as all of the firmware and supporting software. The original design was done

entirely with freeware tools. The primary debugging tool was a 60-MHz Techtronics oscilloscope. Dr. Joyce even used freeware from e-machineshop.com to have faceplates and cases made.