LED Cube
(Courtesy of Todd Nelson and Ryan Straily)

The schematic is broken into 3 hierarchical sections: Figure 1 is the top level schematic which provides an overview of the whole cube circuitry. Figure 2 is the schematic for each plane, which describes how eight shift registers are combined into a plane. Figure 3 is the row level schematic which describes how each row of eight LEDs is controlled with a shift register.

Data bits corresponding to each LED are stored in eight, 74HC164 serial in-parallel out shift registers. Each shift register is connected to a specific digital out pin on the Arduino and corresponds to a row of eight LEDs on the cube. The bits for a specific row of LEDs are shifted in one bit at a time until all eight bits are loaded. Each of the eight rows are loaded this same way simultaneously. On other words, the eight shift registers are in parallel and the data bits for each register are loaded in series. The LED anode columns are connected to the output pins of each shift register through 150Ω current limiting resistors which limit the current to 15mA.

Figure 1: Top Level Schematic
Figure 2: Plane Level Schematic

Figure 3: Row Level Schematic