Prototype of a 12-bit Digital to Analog Converter (DAC) Control System for a Glassman High Voltage Supply Powering a 30 kV Electron Gun

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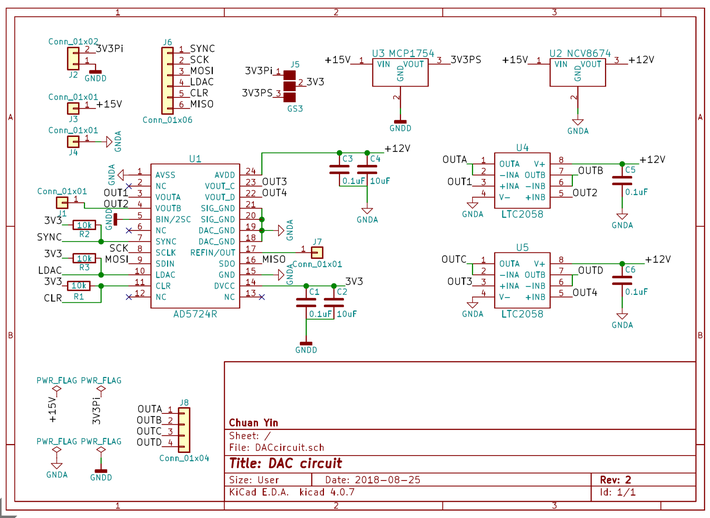
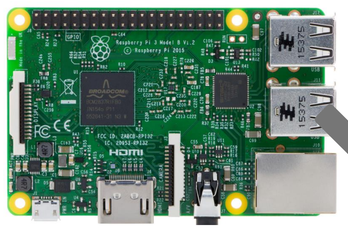
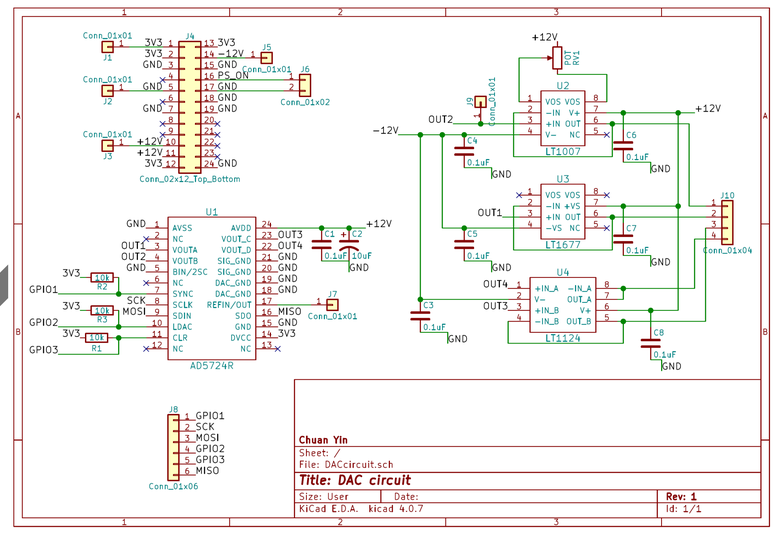
This project concerns building an electronic system to generate a precise 0~10 V analog control signal for Glassman high voltage power supply. The architecture of the system is that a computer remotely accesses a Raspberry Pi, the Raspberry Pi sends a digital code to a DAC chip hosted on a PCB via the SPI protocol, and the DAC with an op-amp circuit produces the precise output voltage that can drive Glassman.



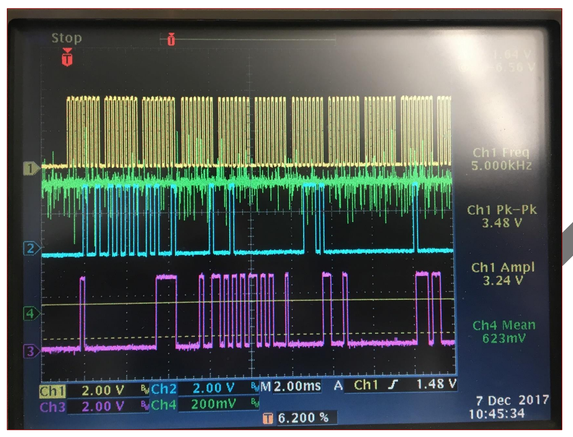


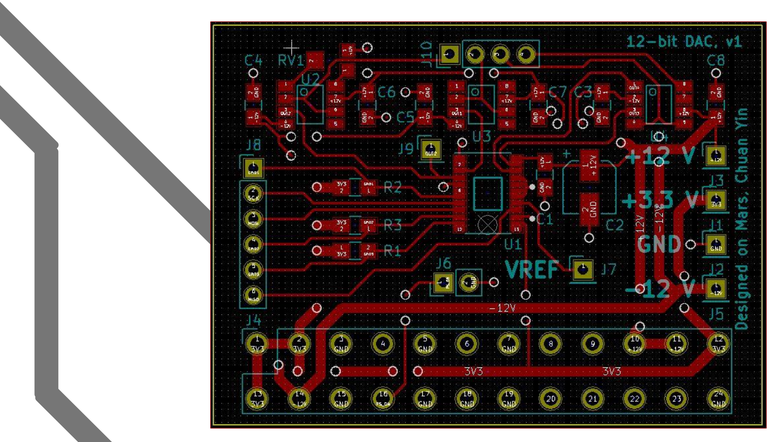
Schematics, v1 and v2



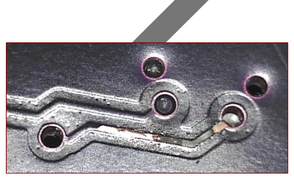

```
#include <wiringPi.h>
#include <wiringPiSPI.h>
using namespace std;
static const int CHANNEL = 0;

int main()
{
    wiringPiSetup ();
    pinMode (2, OUTPUT);
    pinMode (3, OUTPUT);
    digitalWrite (2, HIGH); // LDAC
    digitalWrite (3, LOW);  // CLR
    wiringPiSPISetup(CHANNEL, 5000); // kHz
    cout << "Initialized" << endl;

    // Power control register, power-up reference and alls DACs
    unsigned char refout[3] = {0x10, 0x00, 0x1F};
    wiringPiSPIDataRW(CHANNEL, refout, 3);
    // set DACs range to +10V
    unsigned char setRange[3] = {0x0C, 0x00, 0x01};
    wiringPiSPIDataRW (CHANNEL, setRange, 3);
    // DACB output to 1V
    unsigned char setOut[3] = {0x01, 0x10, 0x00};
    wiringPiSPIDataRW(CHANNEL, setOut, 3);
    // Updates the DAC registers and, consequently, the DAC
output
    unsigned char updateDac[3] = {0x1D, 0x00, 0x00};
    wiringPiSPIDataRW(CHANNEL, updateDac, 3);}
```

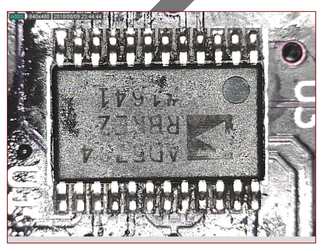
SPI communication

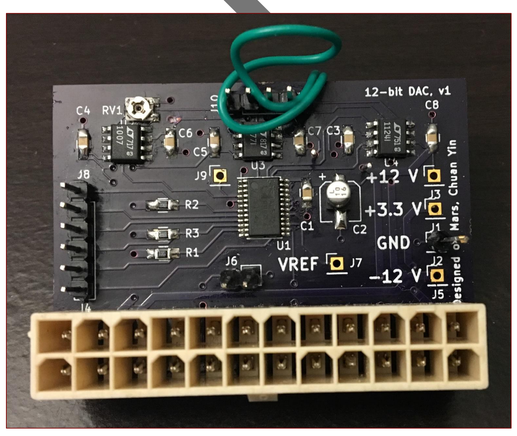


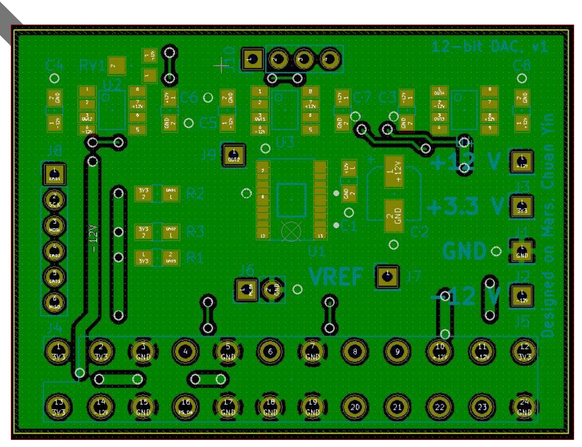


Footprints, front and back









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