

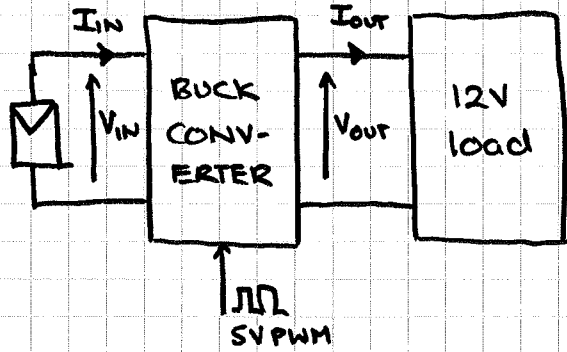
# 12R003 - PV MODULE CONTROL BOARD

23-JAN-11

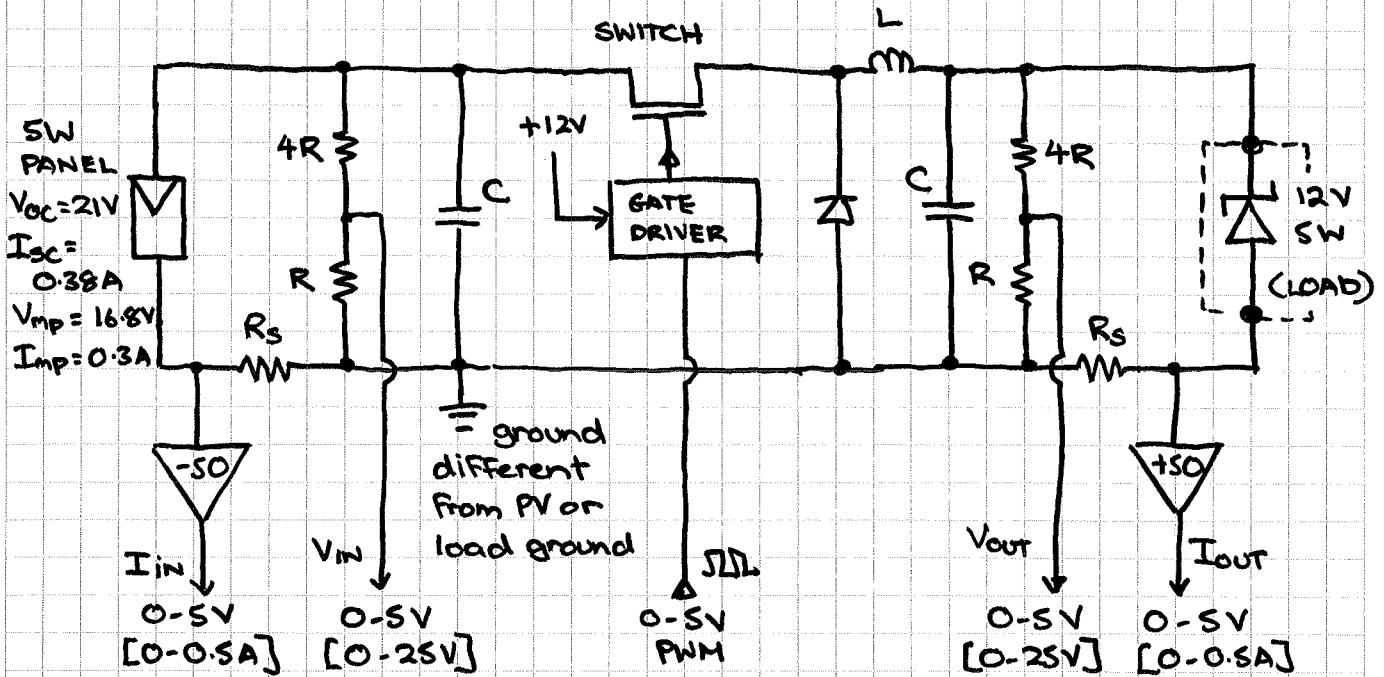
**Aim:** develop a power electronics board to interface a SW PV module to dSpace or a 5V micro-controller board.

input = 0-5V PWM signal for buck

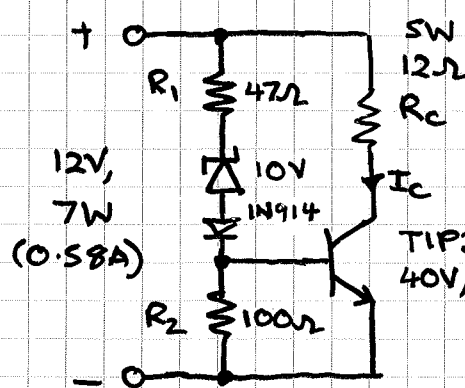
output = 0-5V analog signals for input and output voltages & currents in between = buck converter operating into 12V load



## 1. GENERAL LAYOUT



## 2. 12V LOAD - design to absorb 7W max @ 12V (extra margin over SW)



design  $R_c$  such that with  $I_c = \text{rated } (0.58A)$ ,  $V_{ce} \sim 4V$   
 $\Rightarrow R_c = \frac{8V}{0.58A} = 13.7\Omega$  (use  $12\Omega$ )

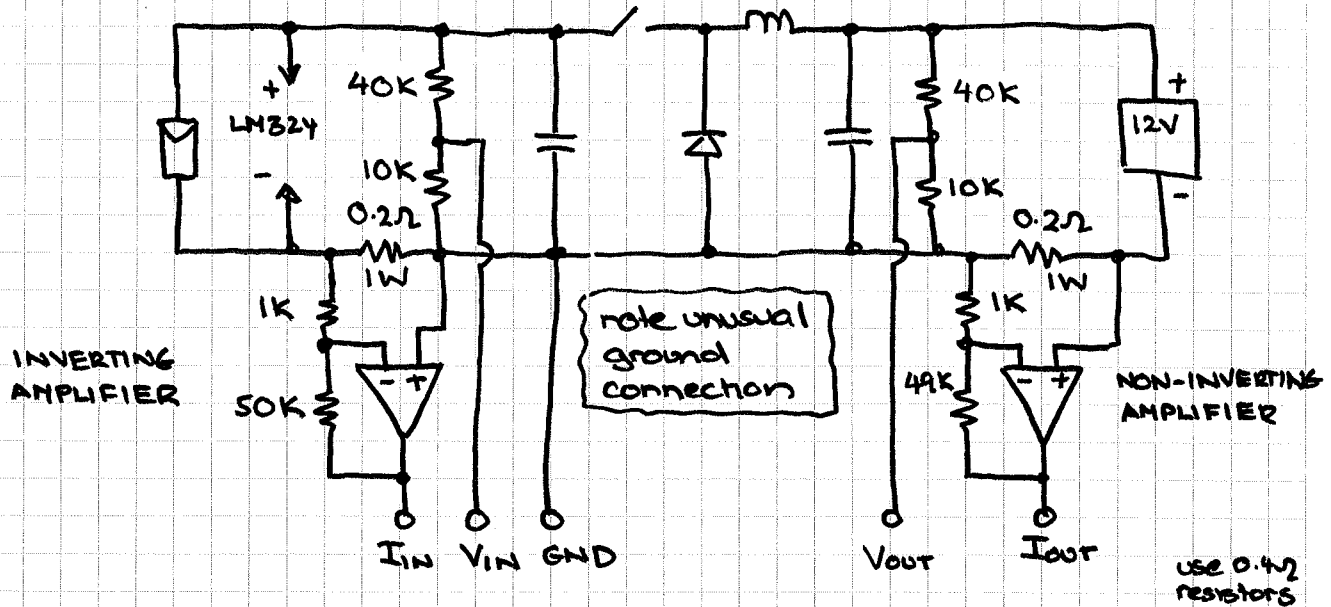
$R_1$  limits max base current to safe value (value not critical)  
 $R_2$  ensures enough current in Zener to operate correctly

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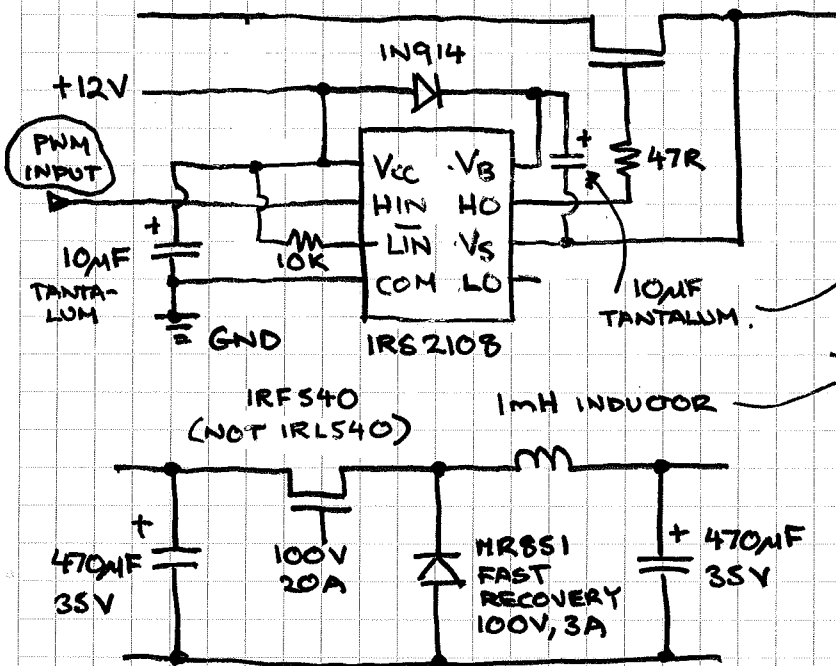
## 3. CURRENT AND VOLTAGE SENSING

This makes use of the LM324, quad op-amp with single-supply operation, capable of operating close to negative supply rail.



uses 100mV voltage drop across current sensing resistors ( $0.5A \times 0.2\Omega = 0.1V$ ), if this is too small, can increase to 200mV while reducing gain of amplifiers from 50 to 25.

## 4. GATE DRIVER AND POWER ELECTRONICS



uses upper gate driver only, uses bootstrap gate drive using diode and capacitor requires separate 12V power supply (external)

ensure tantalum capacitors have correct polarity, else can explode!

For inductor, want low DC resistance - suggest RS Components 228-551, 1mH, 1.6A, 0.46Ω inductor, high current, radial, bobbin \$4.13

" IN THE BEGINNING, GOD CREATED THE HEAVENS AND THE EARTH!"