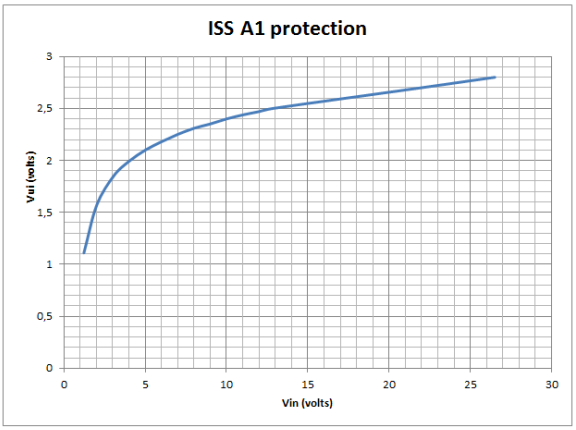
Characteristics Interfacing Screw Shield (149014-91)

<table>
<tr><th>ISS Pin(s)</th><th>Description</th></tr>
<tr><td>A0</td><td>Amplified input with a variable gain from 1x to 101x, adjustable with a potentiometer. The potentiometer is marked "amplify". The amplification is carried out by a dual MCP6232 OPAMP of which only one OPAMP is in use.

As a precaution the A0 input is pulled down to the ground with a 100k resistor, to prevent floating when nothing is connected. The value is so high that connected circuits are normally not affected.

If desired, this resistor can be disabled by removing jumper JP2, but do make sure something is connected to pin A0 before pulling the jumper. A floating input can permanently damage the MCP6232.</td></tr>
<tr><td>A1</td><td>Secure input for up to 15 volts DC.

A 3.3 volt Zener diode ensures that the voltage at the output never exceeds 3.3 volt, well below the 5 volt maximum of the Arduino pins.

<table>
<tr><th>Vin</th><th>Vuit</th></tr>
<tr><td>1,23</td><td>1,11</td></tr>
<tr><td>2,02</td><td>1,57</td></tr>
<tr><td>3,06</td><td>1,85</td></tr>
<tr><td>3,99</td><td>1,99</td></tr>
<tr><td>5,01</td><td>2,1</td></tr>
<tr><td>6</td><td>2,18</td></tr>
<tr><td>6,99</td><td>2,25</td></tr>
<tr><td>8,01</td><td>2,31</td></tr>
<tr><td>8,98</td><td>2,35</td></tr>
<tr><td>10,02</td><td>2,4</td></tr>
<tr><td>11,06</td><td>2,44</td></tr>
<tr><td>12,01</td><td>2,47</td></tr>
<tr><td>12,85</td><td>2,5</td></tr>
<tr><td>22</td><td>2,7</td></tr>
<tr><td>26,5</td><td>2,8</td></tr>
</table>


Figur2 1. Vout (on the Arduino) versus V_{in} (on the ISS).

Because it is not known what voltage the user will be connecting, the resistor has a rather high value, namely 1k.</td></tr>
</table>

	The effect of this is that the current through the Zener diode is limited to a value which is so low that the Zener diode target voltage (3.3 volts) is never reached, so in effect the resulting voltage is always lower. Because the Zener diode is connected to an analog pin (A1 on the Arduino) we can use a low voltage (for example 1 volt) as "on". The advantage of this high resistor value is that you may exceed the maximum voltage of 15 volts without damaging the Arduino.
A2	This input has a calibration potentiometer. Connect a sensor with a variable resistance (for example an LDR) between A2 and the +5 volt or the GND and use potentiometer "Adjust" to calibrate the sensor. The calibration potentiometer can be disabled with jumper JP1.
3V3, 5V and GND	These connectors are directly connected to the Arduino on which the ISS is placed. Of course you do have the convenience of screw terminals.
8-13	These connectors are directly connected to the Arduino on which the ISS is placed. Of course you do have the convenience of screw terminals.
U2-U7	Six outputs that are connected via a ULN2003. That means that Arduino pin 2 for example is connected through the ULN2003 to pin U2 on the ISS. These six outputs provide up to 500 mA together and, if desired, six different voltages from 0 up to 50 volts (switched to ground). The ULN2003 is a 7 channel open Darlington array that has 7 outputs, and can have a maximum voltage of 50 volts. An individual output can deliver 500 mA, but not when you use multiple outputs simultaneously. The graph below is copied from the datasheet, and is valid for the PDIP package (the type that is used on the ISS). The PWM duty cycle is on the horizontal axis, where DC stands for completely on (100%). The vertical axis shows the maximum current consumption in mA. This is peak consumption, so it is the absolute maximum. With a single active output (an output that provides actual current) the

maximum current is 500 mA. With two active outputs the maximum current at full load (DC) is about 390 mA per output. If all seven outputs are in use, the maximum drops to approximately 170 mA per output.

Figure 17. Peak collector current vs. duty cycle (DIP-16)

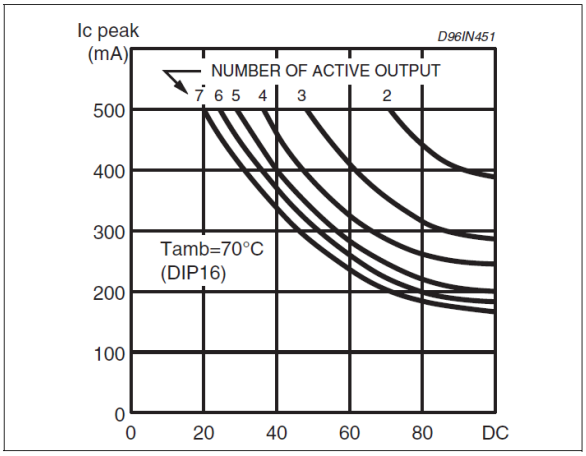


Figure 2. Output Current vs. duty cycle according to the datasheet.

The outputs of this chip may be put in parallel for more power. Put them all seven parallel to have 7 x 170 = 1190 mA at your disposal. I think a heavy heatsink it is not a luxury!

Schematic

The schematic is included so you can see how the different parts are connected. It's free for personal use, but not for commercial applications. Just to be clear: if you make money with it, it is commercial.

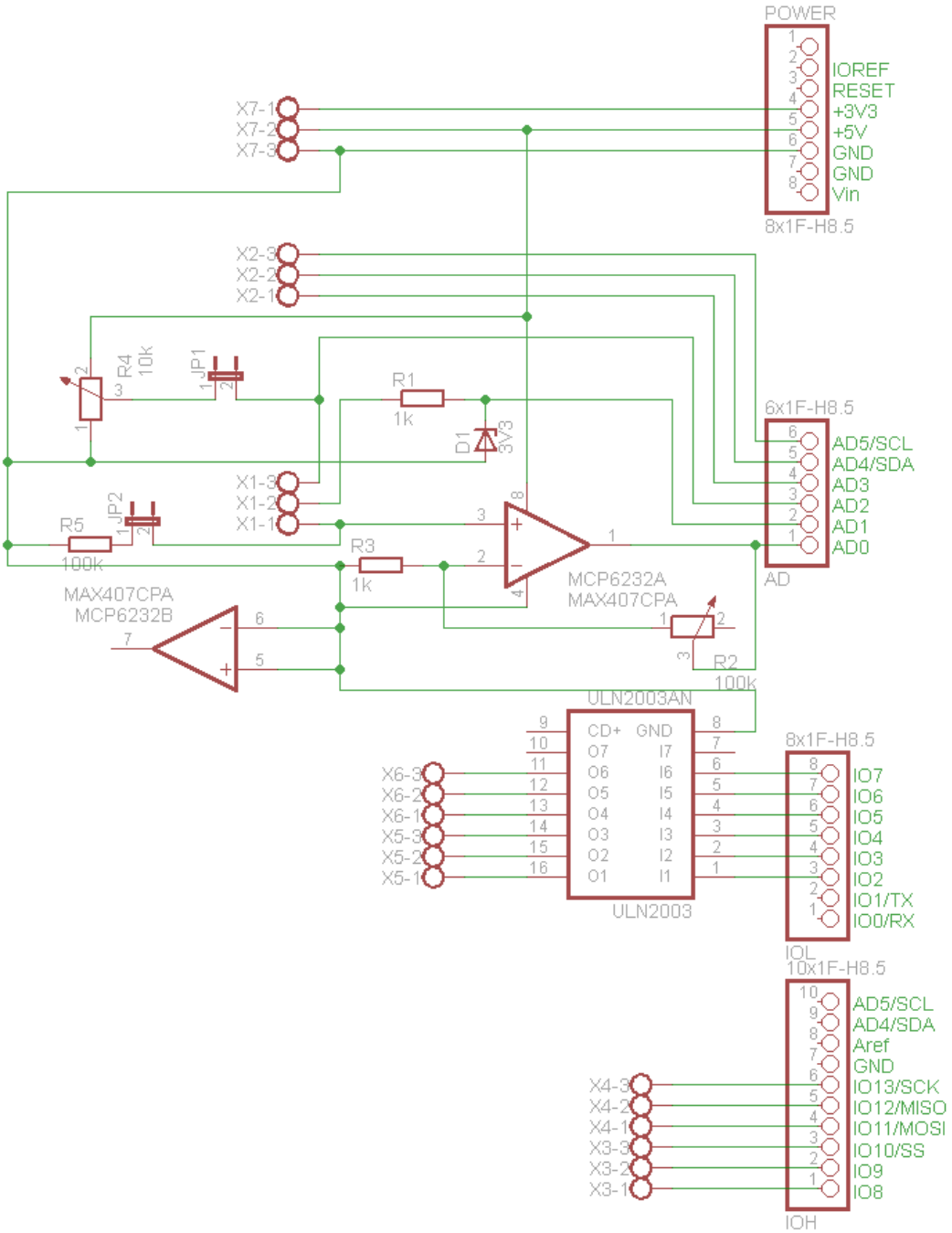


Figure 3. Schematic of the ISS for personal use.