

CDS Cells Primer

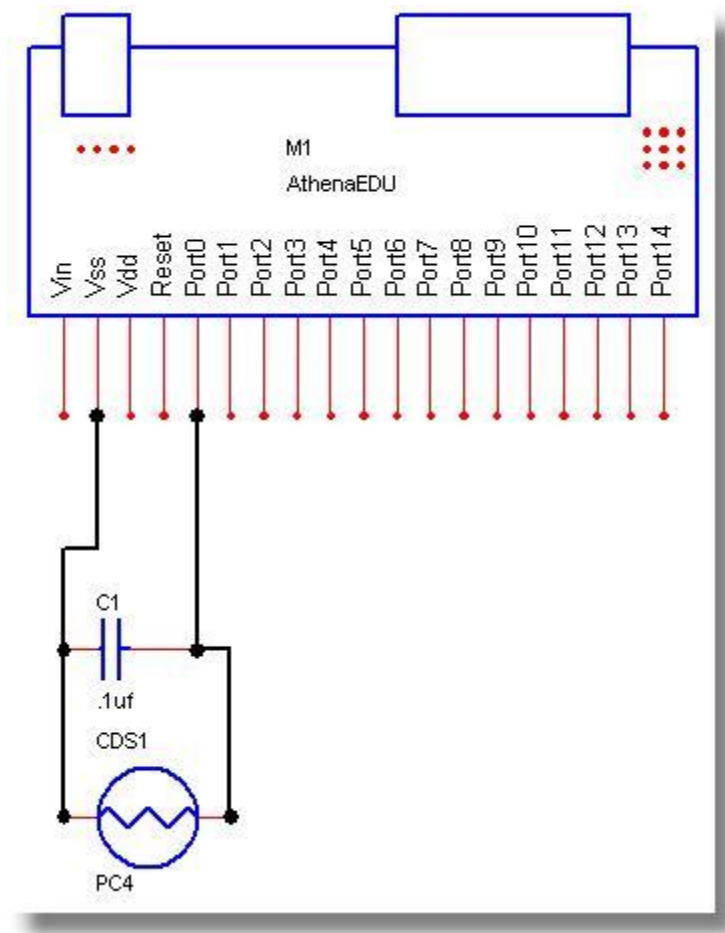
Thursday, April 08 2004 @ 04:19 PM EDT



Not all CDS cells are the same. In this article I will explore this in depth.

I was working on a project that used 2 CDS cells and a servo to track a bright light but just could not figure out why the servo was never centered on the light. The CDS cells I was using were the same product, could it be they were not giving me the same readings? I decided to dig deeper.

The following circuit is a simple RC circuit. The CDS cell is placed across a .1uf capacitor. One end is placed on GND and the other on an IO port.



We charge the capacitor by placing the port high for a few milliseconds. We then place the port in input mode and read the port until it hits a logic state of 0.

Using the pot command we can count how long it takes until the port state hits 0.

```
'Simple Athena CDS cell reader using RC  
' and the pot command
```

```
dim cdsreading
```

```

loop:
  pot 0,2,cdsreading
  print cdsreading

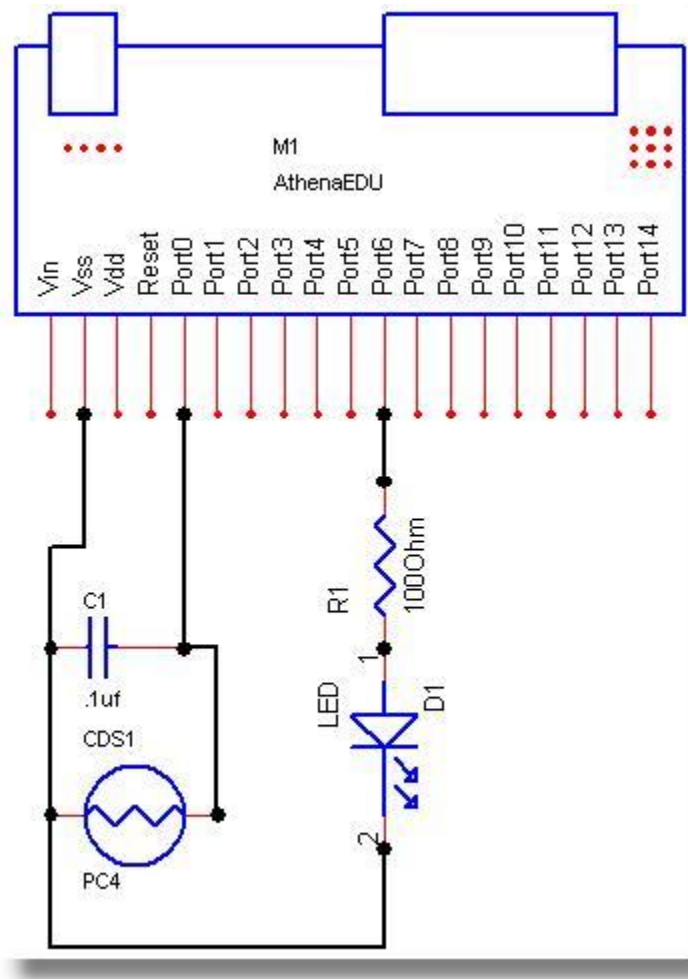
  pause 10
  goto loop

```

The more light the lower the resistance and the faster the capacitor discharges.

I found that in the same light conditions I would get different readings with different CDS cells even though they were supposed to have the same specs.

I decided to create a controlled test environment so that I could test many CDS cells and record the results. We added a yellow LED to the circuit and wired it to the PWM generator so that we could vary its intensity. The LED is pointed directly at the CDS cell and the LED and CDS cell are covered to keep stray light from interfering with the readings.



The following program was used to test the low, mid, and high light level sensitivity of the CDS cell.

```

'CDS Cell Matcher
'This program will vary the intensity of a LED
' and test a CDS Cell in a simple RC circuit

'Define some variables to hold readings
dim highreading
dim midreading
dim lowreading

```

```
output 6 'PWM Channel
```

```
loop:
```

```
'Take High Reading  
hwpwm 0,255,255  
pause 25  
pot 0,2,highreading  
  
'Take Mid Reading  
hwpwm 0,255,50  
pause 100  
pot 0,2,midreading  
  
'Take Low Reading  
hwpwm 0,255,10  
pause 255  
pot 0,2,lowreading  
  
'Display Results  
print lowreading," ",midreading," ",highreading  
goto loop
```

It is important to make sure the CDS cell has ample time to react to the changes. The lower the light the longer is needed to register a correct reading.

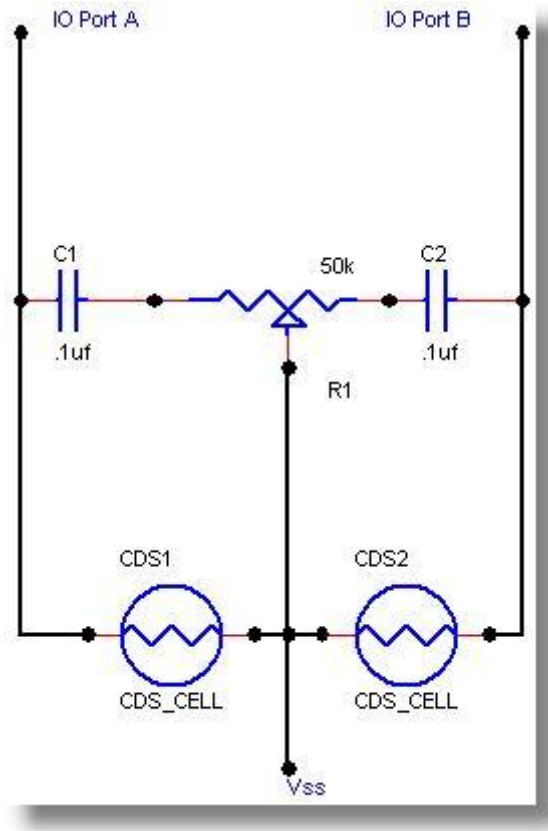
The following are readings I made for 8 different CDS cells.

Cell #	Low	Mid	High
1	163	39	12
2	108	36	15
3	102	27	10
4	255	55	15
5	56	17	7
6	119	34	13
7	72	19	7
8	79	25	10

As you can see the cells vary drastically. If you were doing a project to track the sun and using CDS cells 1 and 5 to move a servo you would be banging your head against the wall trying to figure out why your tracker was constantly off course. In my case I had two cells attached to a servo and the servo would track the brightest light but it never seemed to point at the light. I tried various electronic and software techniques to compensate for mismatched cells but the results did not yield constant results on the high, mid and low tests.

Taking the readings above I could match the following cells. (7,8) or (2,3,4,6). For instance I took cells 7 and 8 and used them in my project and I was off and running. I found that if the low range was within 10 points and the middle within 5 the cells could be used in my project.

This circuit was used to fine tune matching CDS cells so that they were a perfect set.



I decided to look at the readings from the 8 cells outside a RC circuit. I would use the Diods to take analog readings to see how they compared. Here are my results.

Cell #	Low	Mid	High
1	62	30	12
2	62	35	18
3	64	30	13
4	84	45	17
5	44	18	7
6	60	30	14
7	48	20	7
8	54	27	12

We don't want to compare the actual reading from the AtoD to the RC. What we want to do is to see if the slopes match. As you can see they do not. The AtoD readings are more linear.

Final thoughts

While the AtoD readings made the cells easier to match, using the RC method also seemed to yield more consistent readings and they were not affected by battery slopes or motor noise as much as the AtoD method.

Which ever method you choose you should match those CDS cells before starting the project as it will save you some headaches. I hope this helps you in your next CDS cell project. If anything it will help explain a few things.

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