EECS192 Lecture 6
Feb. 23, 2016

Notes:
1. Check off-
   • PCB design due (Gerbers) Tues 2/23 midnight
   • PCB workshop Tues 5 pm
   • Peer review here
   • Final rework due Thurs 2/25 midnight
2. 2/22 Quiz 3: switch mode power supply and regulator
3. CalDay Sat. April 16 @ UCB, Freescale Cup at UC Davis
4. 3/4/2016 : benchtop line tracking (line camera+servo)

Topics
• PCB tip ohms/quare
• Analog Interface
• Latchup gotcha
• Line sensor
• iPython notebook
  (under Resources on Piazza)
For some given depth, resistance is directly in proportion to length and inversely proportional to width. Therefore, we can rate the resistive material of constant depth in terms of ohms per square.

<table>
<thead>
<tr>
<th>Cu Weight oz.</th>
<th>Thickness mm(mils)</th>
<th>mΩ/Square 25°C</th>
<th>mΩ/Square 100°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2</td>
<td>0.02 (0.7)</td>
<td>1.0</td>
<td>1.3</td>
</tr>
<tr>
<td>1</td>
<td>0.04 (1.4)</td>
<td>0.5</td>
<td>0.65</td>
</tr>
<tr>
<td>2</td>
<td>0.07 (2.8)</td>
<td>0.25</td>
<td>0.36</td>
</tr>
<tr>
<td>4</td>
<td>0.13 (5.3)</td>
<td>0.13</td>
<td>0.18</td>
</tr>
</tbody>
</table>
Analog/Digital Overview

Figure 28-1. ADC block diagram
### Public Member Functions

**AnalogIn** (PinName pin)
Create an *AnalogIn*, connected to the specified pin.

<table>
<thead>
<tr>
<th>Type</th>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>float</td>
<td>read ()</td>
<td>Read the input voltage, represented as a float in the range [0.0, 1.0].</td>
</tr>
<tr>
<td>unsigned short</td>
<td>read_u16 ()</td>
<td>Read the input voltage, represented as an unsigned short in the range [0x0, 0xFFFF].</td>
</tr>
<tr>
<td></td>
<td>operator float ()</td>
<td>An operator shorthand for read()</td>
</tr>
</tbody>
</table>
Latchup phenomena

Protection circuit
TSL 1401 line sensor

Functional Block Diagram

- Pixel 1
  - Integrator Reset
- Pixel 2
- Pixel 3
- Pixel 128
  - Analog Bus
  - Output Buffer
  - Gain Trim

- Switch Control Logic
  - Hold
  - Q1
  - Q2
  - Q3
  - Q128

- 128-Bit Shift Register

- CLK
- SI

- Output
  - 3 AO
  - 4 VDD
  - 6, 7 GND
TSL 1401 line sensor

PARAMETER MEASUREMENT INFORMATION

Figure 1. Timing Waveforms

Figure 2. Operational Waveforms
TSL 1401 line sensor
TSL 1401 line sensor