EECS192 Lecture 1
Jan. 17, 2017

- Project Description
- Autonomous system example
- Course Organization
- ARM Cortex M0 overview
- Construction
Hardware
adapted from Thrun et al, JFR 23(9) 2006
128K Flash
16K RAM
32 bit ARM 7 core
48 MHz
A/D, D/A
2x SPI
Touch sense input
Timers
Challenge: Embedded real-time programming

Figure 12.10: Illustration of the priority inheritance protocol. Task 1 has highest priority, task 3 lowest. Task 3 acquires a lock on a shared object, entering a critical section. It gets preempted by task 1, which then tries to acquire the lock and blocks. Task 3 inherits the priority of task 1, preventing preemption by task 2.
Active Threads

READY

event occurs

pre-empt

terminate

create

RUNNING

terminate

create

WAITING

wait

event occurs

terminate

create

INACTIVE

(Figure source: https://developer.mbed.org/handbook/RTOS)
**EE192- Soldering Notes**

- Oxide has lower energy than clean metal
- Higher energy surfaces attract molten solder
- Oxides have higher melting points than metals
- Oxides have lower thermal conductivity than metals
- Flux helps to prevent oxide formation, but is an insulator
Resistor Color Code

From: http://www.hep.fsu.edu/~wahl/phy3802/expinfo/electronics/res-color-code.gif

<table>
<thead>
<tr>
<th>Color</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>0</td>
</tr>
<tr>
<td>Brown</td>
<td>1</td>
</tr>
<tr>
<td>Red</td>
<td>2</td>
</tr>
<tr>
<td>Orange</td>
<td>3</td>
</tr>
<tr>
<td>Yellow</td>
<td>4</td>
</tr>
<tr>
<td>Green</td>
<td>5</td>
</tr>
<tr>
<td>Blue</td>
<td>6</td>
</tr>
<tr>
<td>Violet</td>
<td>7</td>
</tr>
<tr>
<td>Gray</td>
<td>8</td>
</tr>
<tr>
<td>White</td>
<td>9</td>
</tr>
</tbody>
</table>

Multiplier

1st Digit — 4
2nd Digit — 0
Multiplier — 000
Tolerance — 2% - Red
5% - Gold
10% - Silver

Capacitor Codes

From: http://www.applefritter.com/sites/default/meta/replicacreation/images/fige-10.png

<table>
<thead>
<tr>
<th>Value</th>
<th>Code</th>
<th>Multilayer (270 pF)</th>
<th>Ceramic Discs (0.001 μF)</th>
<th>Electrolytic (1 μF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 pF</td>
<td>100</td>
<td></td>
<td></td>
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<tr>
<td>100 pF</td>
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<tr>
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<td>102</td>
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<td></td>
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<tr>
<td>.001 μF</td>
<td>102</td>
<td></td>
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<tr>
<td>.01 μF</td>
<td>103</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>.1 μF</td>
<td>104</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Yellow | violet | orange | gold

Better be right or your great big venture goes west…
CAP CER 0.1UF 50V X7R RADIAL

0.1µF ±20% 50V Ceramic Capacitor Z5U Radial

CAP CER 0.1UF 630V X7R RADIAL


CAP CER 0.1UF 50V X7R 0805
Capacitor Types - 47 uF 50V

Ripple Current
600mA

Eletrolytic Ripple Current
169mA @ 120Hz

Metalized film
CAP TANT 22UF 50V
20% 2917

https://industrial.panasonic.com

Fig.13 ESR vs frequency