Lecture 10

Thermal Sensors
DS1620

- Digital thermometer
  - Provides 9-bit temperature readings
  - Temperature range from -55°C to 125°C
  - Acts as a thermostat
## Detail Description

<table>
<thead>
<tr>
<th>PIN</th>
<th>SYMBOL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DQ</td>
<td><strong>Data Input/Output pin</strong> for 3-wire communication port.</td>
</tr>
<tr>
<td>2</td>
<td>CLK/CONV</td>
<td><strong>Clock input pin</strong> for 3-wire communication port. When the DS1620 is used in a stand-alone application with no 3–wire port, this pin can be used as a convert pin. Temperature conversion will begin on the falling edge of CONV.</td>
</tr>
<tr>
<td>3</td>
<td>RST</td>
<td><strong>Reset input pin</strong> for 3-wire communication port.</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>Ground pin.</td>
</tr>
<tr>
<td>5</td>
<td>T_{COM}</td>
<td><strong>High/Low Combination Trigger</strong>. Goes high when temperature exceeds TH; will reset to low when temperature falls below TL.</td>
</tr>
<tr>
<td>6</td>
<td>T_{LOW}</td>
<td><strong>Low Temperature Trigger</strong>. Goes high when temperature falls below TL.</td>
</tr>
<tr>
<td>7</td>
<td>T_{HIGH}</td>
<td><strong>High Temperature Trigger</strong>. Goes high when temperature exceeds TH.</td>
</tr>
<tr>
<td>8</td>
<td>V_{DD}</td>
<td><strong>Supply Voltage</strong>. 2.7V – 5.5V input power pin.</td>
</tr>
</tbody>
</table>
DS1620 with BS2
Programming for DS1620 1

Waiting state of DS1620

Low 13 ← Ready to start

High 13 ←

Shiftout 15,14,lsbfirst,[12,2]

Two bytes from BS2 to DS1620

For Configuration

0: No CPU, continuous conversion
1: No CPU, one-shot conversion
2: Yes CPU, continuous conversion
3: Yes CPU, one-shot conversion

Least significant bit is sent first

Clock

Sending the data bytes to P15
Programming for DS1620 2

high 13 ←− − − − − − − − − − − Ready to start
Shiftout 15,14,lsbfirst,[238] ←− − − Start conversion
low 13

Temploop:
high 13
shiftout 15,14,lsbfirst,[170] ←− − − Send “get data” command
shiftin 15,14,lsbpre,[x] ←− − − − Get the data
low 13
degC=x/2
Goto Temploop
AD592

- Analog temperature sensor
  - Provides an output current proportional to absolute temperature
  - Temperature range from -25°C to 105°C
  - Acts as a thermostat
  - Extended out away from the recording instruments
Temperature Probe with AD592

- The part needs to be protected before being inserted into liquid
How to Make Temperature Probe 1

1. Identify the AD 592’s (-), NC, and (+) pins from this picture as viewed from the bottom

2. Slip the solder sleeve over the black wire and pin 3 (-)

3. Slip another solder sleeve over the red wire and pin 1 (+)

4. Heat up the connections until the wires are joined
How to Make Temperature Probe 2

5. Slip the heat shrink tubing over the entire package

6. Fasten the package with a heat gun, and while it’s still hot clamp the top portion to ensure that it stays shut
AD592 with BS2
Caution!!

- Be careful when you put your finger on it
- Specially for a big finger
# Temperature Sensors Experiments

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<thead>
<tr>
<th>Experiments</th>
<th>Chapters</th>
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<tr>
<td>What’s micro controller</td>
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<td>1, 2, 3*, and 4</td>
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<td></td>
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<tr>
<td>StampWorks</td>
<td>29</td>
</tr>
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<td>Others</td>
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*Use 2 wires for Simple Resistance Detector with proper resistor and capacitor*
Lecture 11

Robotics
Robots
Definition of Robot

• First introduced by Karel Capek in a 1920

• Definition of robot
  • Reprogrammable
  • Multifunctional manipulator
  • Designed to move material, parts, tools or specialized devices
  • Through variable programmed motions for the performance of a variety of tasks
  • Robot Institute of America, 1979
Sensors

In-Sight vision sensors

Devantech SRF04

UltraSonic Ranger

Force Sensors

Tilt Sensor
Actuators

• Actuators used in robotics is almost always combinations of different electro-mechanical devices
  – Stepper motor
  – AC servo motor
  – Brushless DC servo motor
  – Brushed DC servo motor
Hydraulic Motor

Stepper Motor

Pneumatic Motor

Servo Motor
Controller

RoboBoard Robotics Controller

BASIC Stamp 2 Module
The Interface Units

Interfacing with the external world (sensors and actuators)

Analog to Digital Converter

Operational Amplifier
What Can a Robot Do?

- Industrial Robots
  1. Material Handling
  2. Material Transfer
  3. Machine Loading and/or Unloading
  4. Spot Welding
  5. Continuous Arc Welding
  6. Spray Coating
  7. Assembly
  8. Inspection
How to Modify Servo Motor
Prepare All the Tools
Open Cover
Take All Gears Out
Take Pot Drive Plate Out

Don’t forget to remove it

Potentiometer drive plate

First gear

Second gear

Third gear

Final gear
Cut Tab off the Surface of the Gear
Servo Calibration

```
low 12

loop:
pulsout 12, 750
pause 20
goto loop
```
Fully Assembled Boe-Bot
# Robot Experiments

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