How many microcontrollers do you see on the picture?
We live in a wonderful time
while (true) {
    toggle(PB0);
    delay_ms(1000);
}

while(true) { 
    toggle(PB0);
    delay_ms(1000);
}
while(true) {
    toggle(PB0);
    delay_ms(PB3 ? 1000 : 500);
}
Prototyping boards

- MSP430 LaunchPad
- STM32F Discovery
- Grasshopper AVR
- Teensy
- FEZ Panda/Hydra/…
- Mbed
- BeagleBone/CubieBoard
- Arduino/Pinguino/Netduino/Freeduino/…
- …
1. Circuit design

2. Prototyping

3. PCB Design

4. Manufacturing

5. Soldering
1. Circuit design

2. Prototyping

3. PCB Design

4. Manufacturing

5. Soldering
Atmel 8-bit AVR Microcontroller with 2/4/8K Bytes In-System Programmable Flash

ATtiny25/V / ATtiny45/V / ATtiny85/V

Features

• High Performance, Low Power AVR® 8-Bit Microcontroller
• Advanced RISC Architecture
  – 120 Powerful Instructions – Most Single Clock Cycle Execution
  – 32 x 8 General Purpose Working Registers
  – Fully Static Operation
• Non-volatile Program and Data Memories
  – 2/4/8K Bytes of In-System Programmable Program Memory Flash
    • Endurance: 10,000 Write/Erase Cycles
  – 128/256/512 Bytes In-System Programmable EEPROM
    • Endurance: 100,000 Write/Erase Cycles
  – 128/256/512 Bytes Internal SRAM
  – Programming Lock for Self-Programming Flash Program and EEPROM Data Security
• Peripheral Features
  – 8-bit Timer/Counter with Prescaler and Two PWM Channels
  – 8-bit High Speed Timer/Counter with Separate Prescaler
    • 2 High Frequency PWM Outputs with Separate Output Compare Registers
    • Programmable Dead Time Generator
Through-hole technology
Surface mount technology
1. Circuit design

2. Prototyping

3. PCB Design

4. Manufacturing

5. Soldering
Breadboard
Breadboard
1. Pin Configurations

Figure 1-1. Pinout ATtiny25/45/85

<table>
<thead>
<tr>
<th>PDIP/SOIC/TSSOP</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>(PCINT5/RESET/ADC0/dW) PB5</td>
<td>VCC</td>
<td>PB2 (SCK/USCK/SCL/ADC1/T0/INT0/PCINT2)</td>
<td>PB1 (MISO/DO/AIN1/OC0B/OC1A/PCINT1)</td>
<td>PB0 (MOSI/DI/SDA/AIN0/OC0A/OCTA/AREF/PCINT0)</td>
<td>GND</td>
<td>PB3 (PCINT3/XTAL1/CLKI/OCTB/ADC3)</td>
<td>PB4 (PCINT4/XTAL2/CLKO/OC1B/ADC2)</td>
<td>VCC</td>
</tr>
</tbody>
</table>

NOTE: TSSOP only for ATtiny45/V
1. Circuit design
2. Prototyping
3. PCB Design
4. Manufacturing
5. Soldering
Chemical etching
CNC milling
The easy way

1. Upload your design
   Please don’t forget to include the drill drawing

2. Fill in the PCB parameters

3. Add to the cart
1. Circuit design
2. Prototyping
3. PCB Design
4. Manufacturing
5. Soldering
Soldering

- **General:**
  - Use an ESD mat,
  - Use a ventilated room,
  - Be careful with the tip of the soldering iron.

- **Set up:**
  - Wet the sponge, clean the tip, tin the tip
  - 350-360°C is good for lead-based solder
  - 370-380°C is good for lead-free solder
Soldering

- Solder smaller components first
- Solder corners first
- Use the flux
- **Check for bridges** after finishing

*slightly different approach for SMDs*

http://www.circuitrework.com
Soldering

- **In the end**
  - Clean the tip, *tin the tip*

- If the flux is conductive:
  - Clean it away with alcohol
  - Check for bridges
  - Use a current limiter at first