

Introducing the ATtiny to Mac hackers

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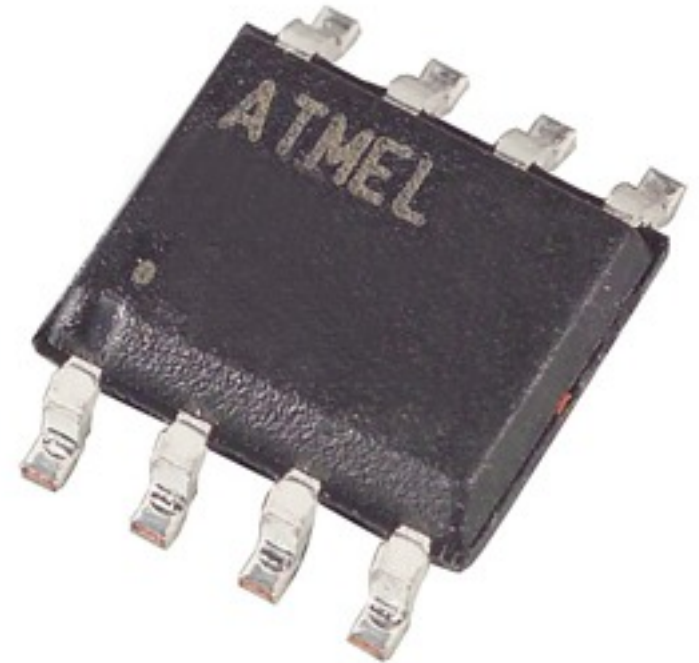


Deploy hundreds of copies of a prototype, not just a few
Cost becomes issue

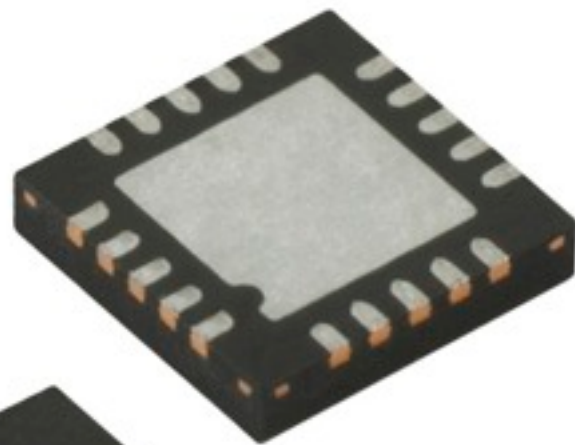
ATMEL ATtiny85



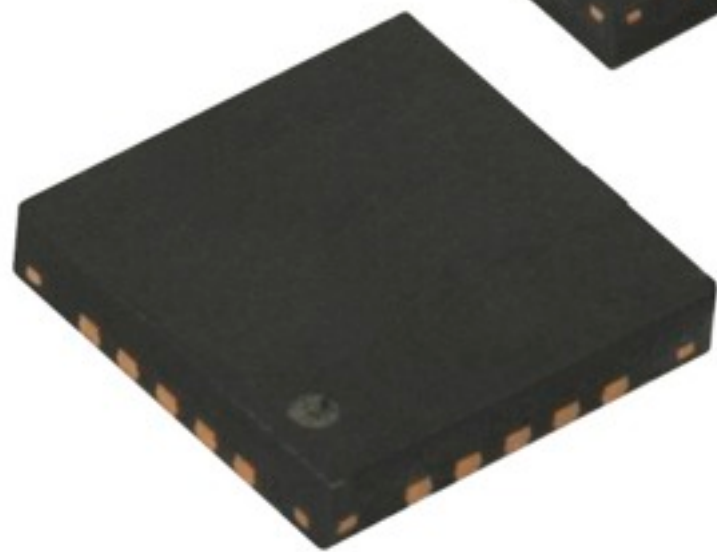
DIP



SOIC



QFN



ATtiny is the new 555: The NE555 Timer of the 21st century :)

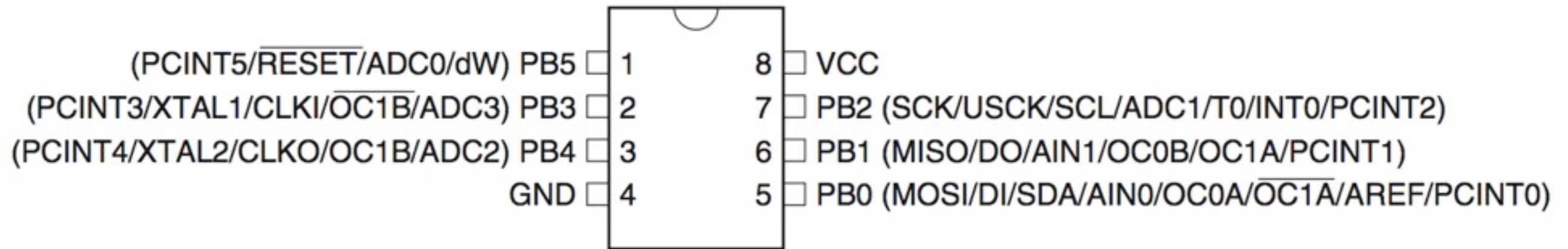


ATtiny: Sub-1\$ for smallest memory version (ATtiny25)
Smaller, simpler (and often cheaper) than ATmegs

ATtiny85

- AVR: Inventor, ATMEL: Manufacturer
- Harvard architecture
- 8K program Flash, 1/2 K RAM, 1/2K EEPROM
- 6 I/O, clock, timers, interrupts, PWM, ADC
- Serial, Debug I/F, self-programming
- 0...20MHz RISC
- 1.8...5.5V, μ A's power consumption

PDIP/SOIC



From the datasheet

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 Byte of In-System Programmable Program Memory Flash (ATtiny25/45/85)
 - Endurance: 10,000 Write/Erase Cycles
 - 128/256/512 Bytes In-System Programmable EEPROM (ATtiny25/45/85)
 - Endurance: 100,000 Write/Erase Cycles
 - 128/256/512 Bytes Internal SRAM (ATtiny25/45/85)
 - 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
 - USI – Universal Serial Interface with Start Condition Detector
 - 10-bit ADC
 - 4 Single Ended Channels
 - 2 Differential ADC Channel Pairs with Programmable Gain (1x, 20x)
 - Temperature Measurement
 - Programmable Watchdog Timer with Separate On-chip Oscillator
 - On-chip Analog Comparator
- Special Microcontroller Features
 - debugWIRE On-chip Debug System
 - In-System Programmable via SPI Port
 - External and Internal Interrupt Sources
 - Low Power Idle, ADC Noise Reduction, and Power-down Modes
 - Enhanced Power-on Reset Circuit
 - Programmable Brown-out Detection Circuit
 - Internal Calibrated Oscillator
- I/O and Packages
 - Six Programmable I/O Lines
 - 8-pin PDIP, 8-pin SOIC and 20-pad QFN/MLF
- Operating Voltage
 - 1.8 - 5.5V for ATtiny25/45/85V
 - 2.7 - 5.5V for ATtiny25/45/85
- Speed Grade
 - ATtiny25/45/85V: 0 - 4 MHz @ 1.8 - 5.5V, 0 - 10 MHz @ 2.7 - 5.5V
 - ATtiny25/45/85: 0 - 10 MHz @ 2.7 - 5.5V, 0 - 20 MHz @ 4.5 - 5.5V
- Industrial Temperature Range
- Low Power Consumption
 - Active Mode:
 - 1 MHz, 1.8V: 300 μ A
 - Power-down Mode:
 - 0.1 μ A at 1.8V



**8-bit AVR[®]
Microcontroller
with 2/4/8K
Bytes In-System
Programmable
Flash**

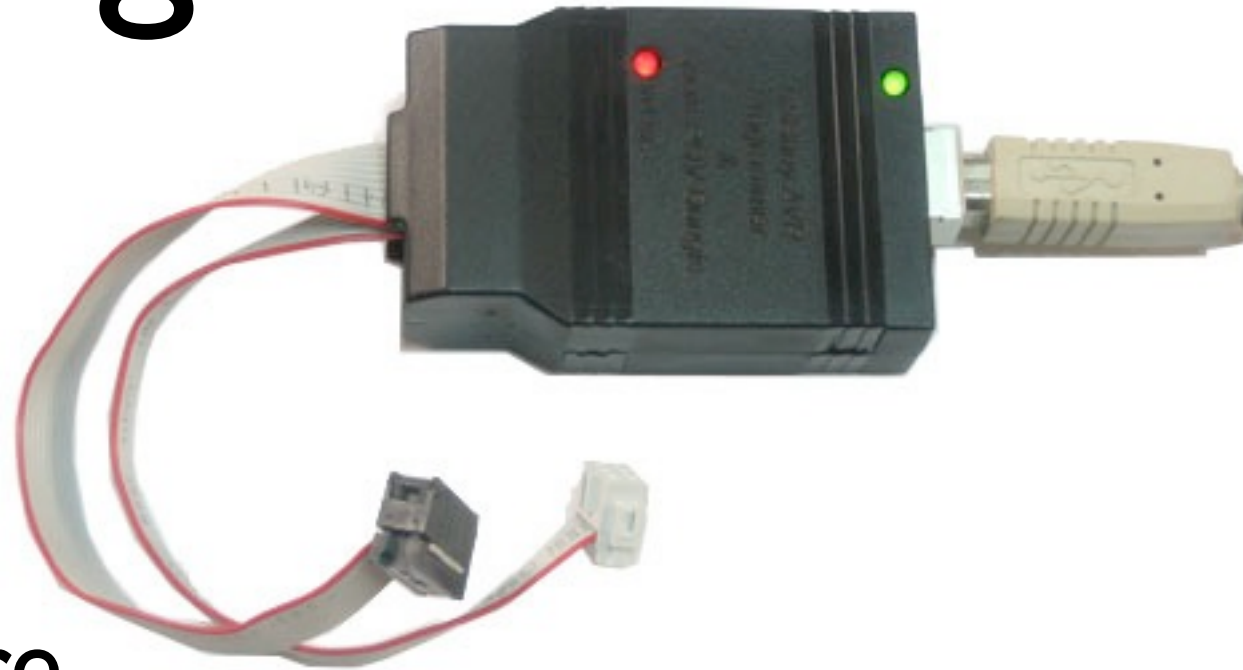
ATtiny25/V *
ATtiny45/V
ATtiny85/V *

*** Preliminary**

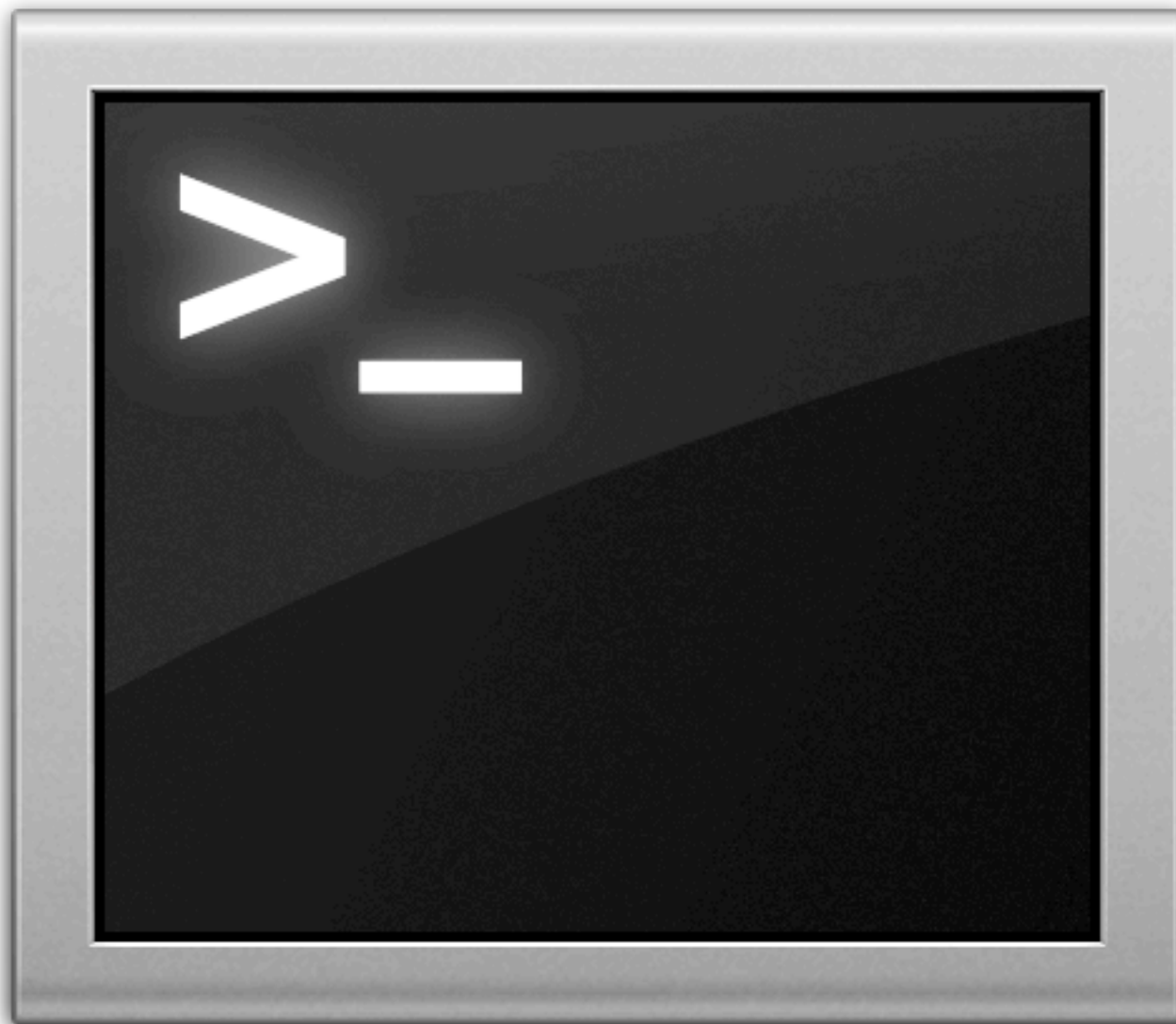
2586K-AVR-01/06



USBtiny In-System Programmer



- Open Source Hardware
- USB to 6-pin ICSP (In-Circuit System Programming Interface) of AVR μ Controllers
- Kits available, \$20 from Adafruit



- avrlibc
- avr-gcc
- avrdude
- ...

Best cross-platform way to program AVR: command-line tools

CrossPack



All current AVR command-line tools in a package ported to Mac OS X
<http://www.obdev.at/products/crosspack/index.html>

AVR Embedded C

```
#include <avr/io.h>
#include <util/delay.h>

#define LED 1<<0

int main(void)
{
    DDRB = LED;                                // Set LED Port B, bit
                                                // (PB0, physical pin 5) to
                                                // output, rest to input
                                                // Repeat forever:
    for(;;){
        PORTB |= LED;                          // Turn on LED
        _delay_ms(1000);                      // Wait 1s
        PORTB &= ~LED;                        // Turn off LED
        _delay_ms(1000);                      // Wait 1s
    }
}
```

<http://hci.rwth-aachen.de/attiny>

Links to datasheets, tools, books, etc.