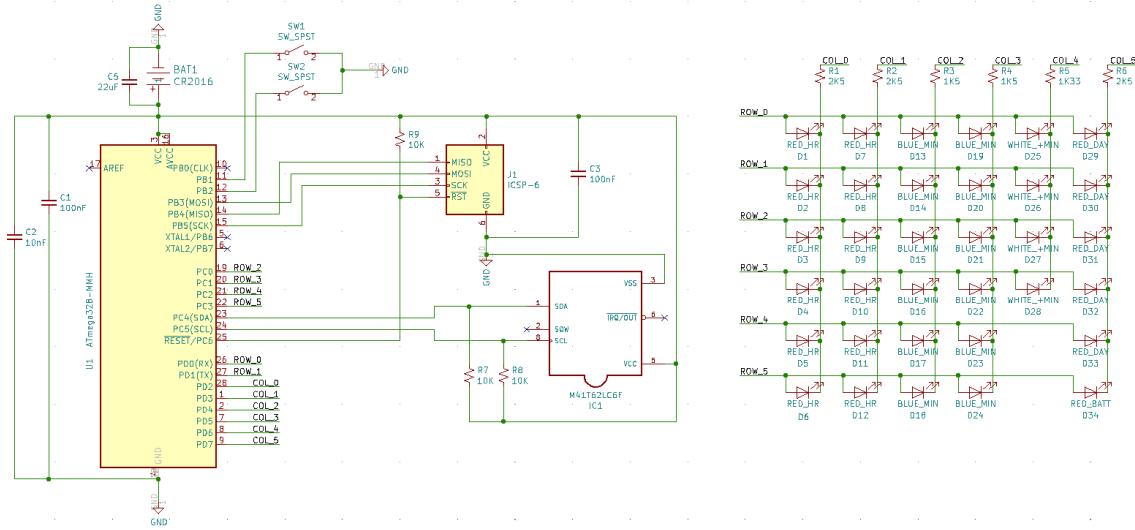
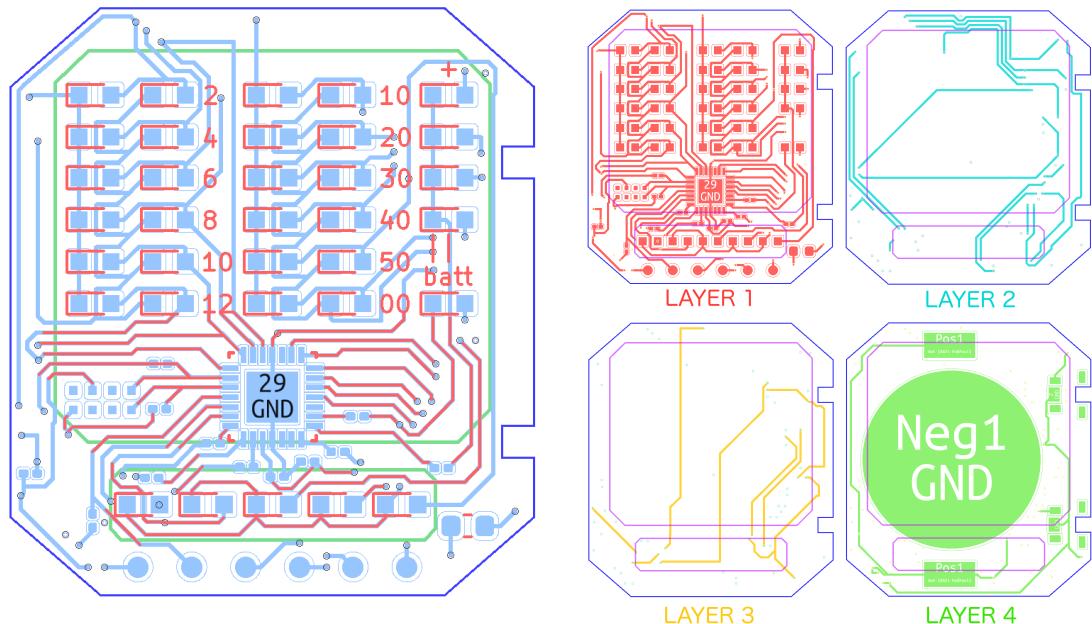


# LED watch

## Schematic



## Printed circuit board

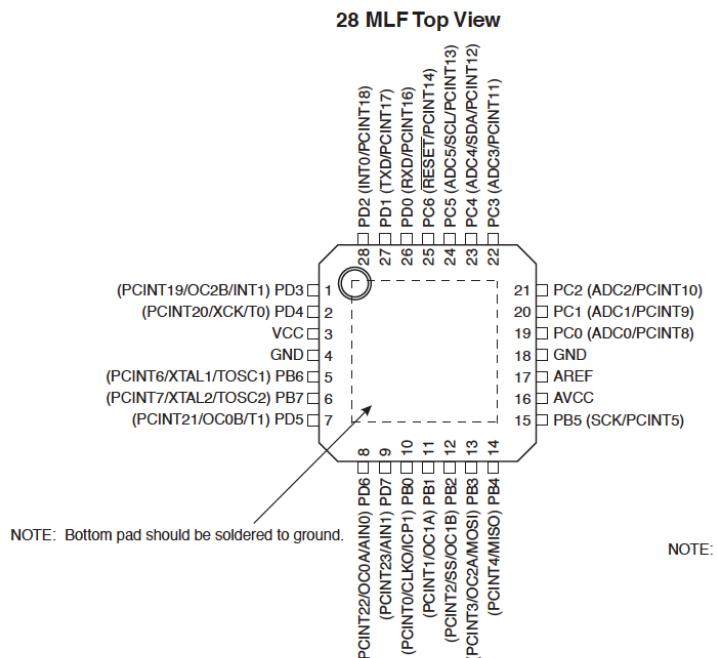


Layer 1 (blue) with silkscreen (red)

## Integrated components

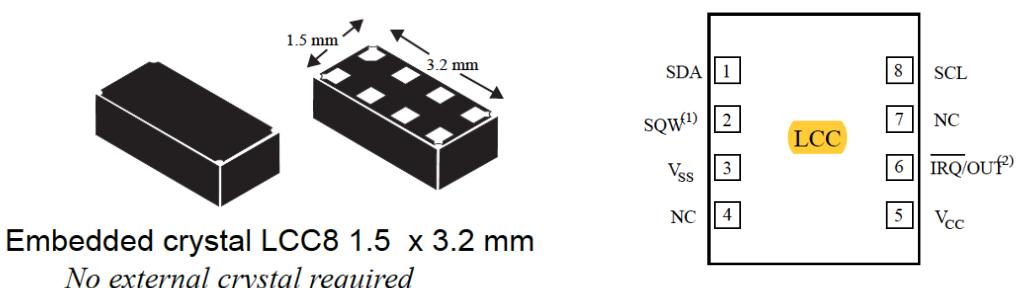
### ATMEGA328P

- The ATmega328P is a low power, CMOS 8-bit microcontroller based on the AVR® enhanced RISC architecture. By executing instructions in a single clock cycle, the device achieves CPU throughput approaching one million instructions per second (MIPS) per megahertz, allowing the system designer to optimise power consumption versus processing speed.

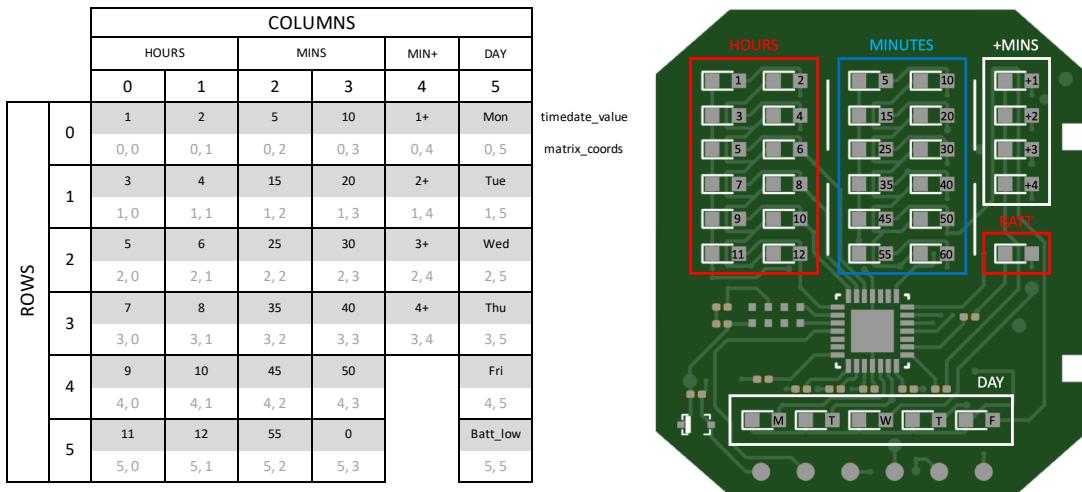


### Low-power serial real-time clock (RTC) with alarm

- Serial real-time clock (RTC) with alarm functions
  - 400 kHz I2C serial interface
  - Memory mapped registers for seconds, minutes, hours, day, date, month, year, and century
  - Tenths/hundredths of seconds register
- 350 nA timekeeping current at 3 V
- Timekeeping down to 1.0 V
- 1.3 V to 4.4 V I2C bus operating voltage
  - 4.4 V max VCC suitable for lithium-ion battery operation
- Low operating current of 35 µA (at 400 kHz I2C speed)



# Programming functions

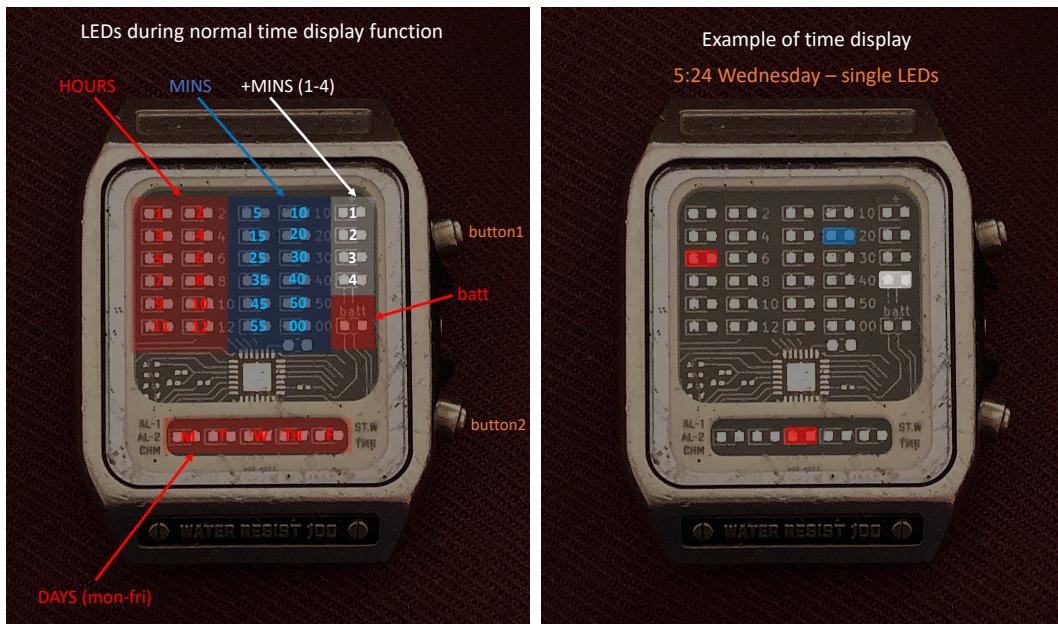


Multiplexed LED matrix (left) and physical location of LEDs on watch face (right)

Only one LED is powered at a time and the microcontroller cycles through all LEDs using 10 I/Os at least 100 cycles per seconds to prevent visible flickering (using persistence of vision).

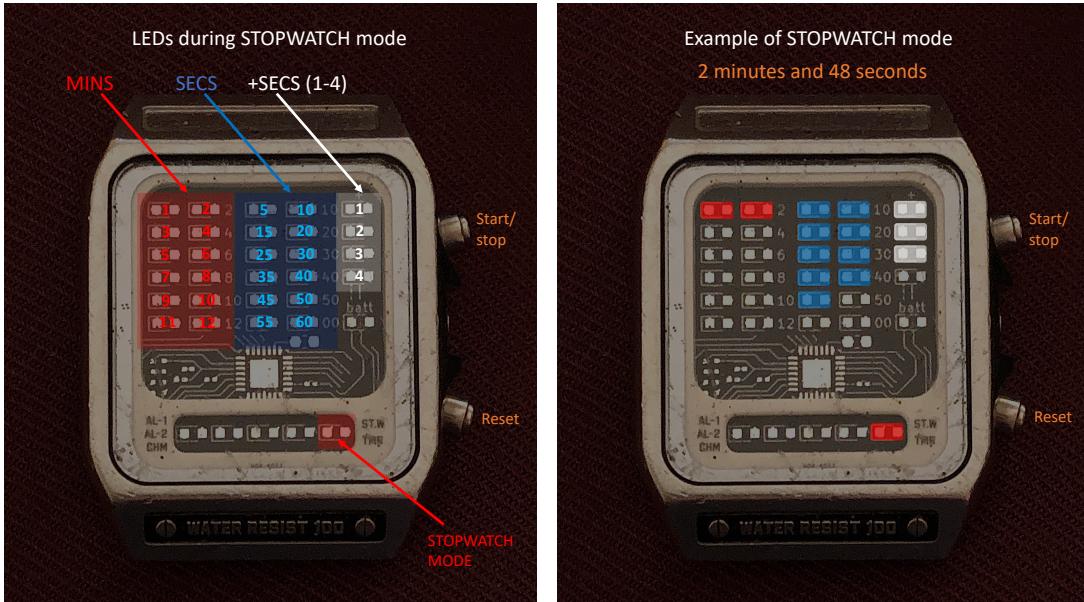
## Display Time

- 1 x button1 press displays the time for 2 seconds



## Stopwatch

- The timer increments by seconds up to a maximum of 12 minutes (using hour LEDs)
- Button2 held down for three seconds to activate stopwatch mode
  - D33 LED (Friday) flashes five times (on: 200ms, off: 200ms)
- Button2 held down for three seconds to deactivate
  - D33 LED (Friday) turns off
- Hours function as minutes, minutes as seconds, and +minutes as +seconds



## Light

- 3 x fast button2 presses to activate
- 3 x fast button2 presses to deactivate

