

Microprocessor

Ch.8 Hardware Connection

OUTLINE

- Pin description
- DS89C4x0 Trainer
- Intel Hex file

PIN: LAYOUT

- **Pin layout**

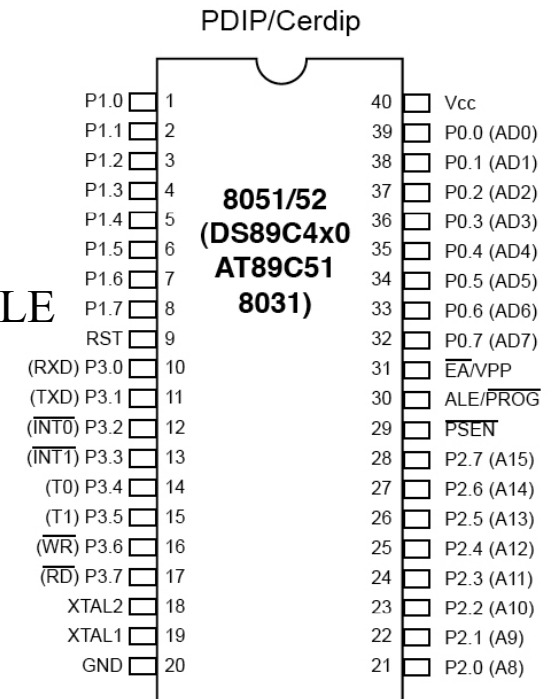
- A total of 40 pins
- 32 pins are used for I/O ports (8 pins/port, 4 ports)
- The remaining 8 pins
 - Vcc, GND, XTAL1, XTAL2, RST, $\overline{EA}$, $\overline{PSEN}$, ALE

- **Vcc**

- Pin 40. Provide supply voltage to the chip.
- Voltage source is +5V.

- **GND**

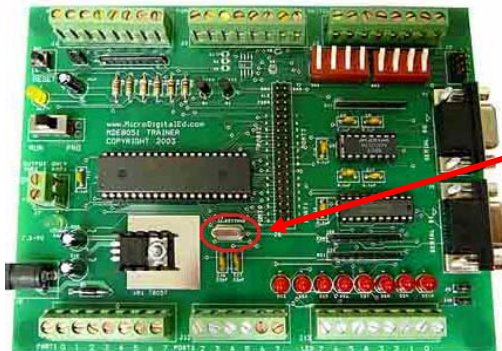
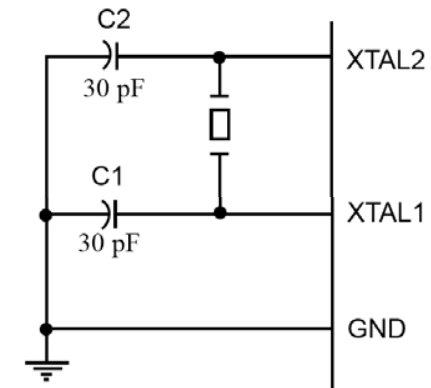
- Pin 20. Ground



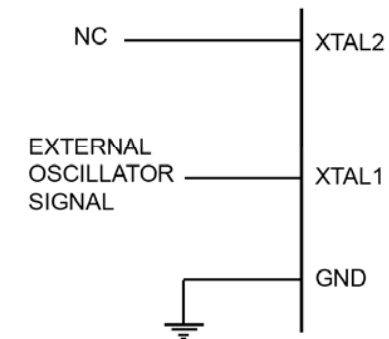
PIN: XTAL1 AND XTAL2

- **XTAL1 and XTAL2**

- Provide external clock to the 8051 (input pins)
- Configuration 1 (most common):
 - Connect to a quartz crystal oscillator
 - Crystal oscillator can generate square waveform at a fixed frequency (e.g. 11.0592 MHz)
 - Different 8051 chips have different speed ratings
 - E.g. a 12-MHz chip can only be connected to a crystal oscillator with frequency 12 MHz or lower.
 - We can observe the clock with an oscilloscope on XTAL2 pin
- Configuration 2:
 - Connect it to an external TTL oscillator (e.g. a clock signal generated by a function generator)
 - Only XTAL1 is used, XTAL2 is left unconnected (NC: not connected)



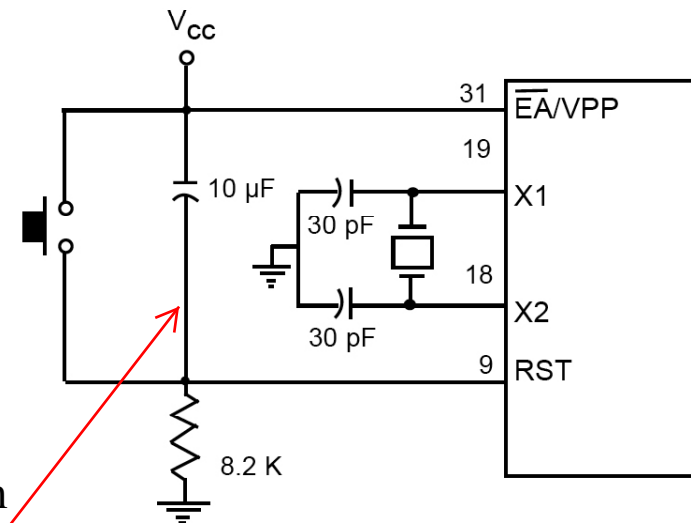
crystal oscillator



PIN: RST

- **RST**

- Reset (input pin)
- Active high: upon applying a high pulse to the pin, the uC will reset and terminate all activities.
 - Normally it's value is low so uC can work normally.
 - In order for it too be effective, the high pulse must be high for a minimum of 2 machine cycles.
- Reset by switch
 - When SW is open, RST is low
 - When SW is closed, RST is high
 - When SW is released, RST is low
→ reset.
- Power on reset
 - At the instant of power on, RST is high
 - After a while, the capacitor will be fully charged
 - In steady state, RST is low.



PIN: $\overline{EA}$, $\overline{PSN}$, AND ALE

- **8031**

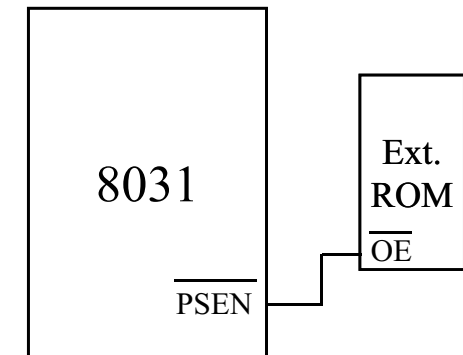
- A simplified version of 8051, it doesn't have built in ROM or RAM 
- It needs to be connected to external ROM and RAM through $\overline{EA}$, $\overline{PSN}$, and ALE

- **$\overline{EA}$**

- External access (input pin): indicate whether there is external ROM
- Active low: it's effective when the voltage is low
- If it is connected to ground → there is external ROM
- If it is connected to Vcc → there is no external ROM

- **$\overline{PSN}$**

- Program store enable. (output pin)
- If external ROM is connected to the uC, this pin is connected to the OE (output enable) pin of the ROM to enable the output of the ROM.
- Active low: it's effective when the voltage is low



- **ALE**

- Address latch enable (output pin)
- Port 0 is used as both address bus and data bus for external RAM
- If it's high, then P0 is used as address bus; if it's low, then P0 is used as data bus.



PIN: DEFAULT VALUES

- The default value of some 8051 registers upon reset

Register	Reset Value (hex)
PC	0000
DPTR	0000
ACC	00
PSW	00
SP	07
B	00
P0-P3	FF

- Machine cycle and crystal frequency

Chip (Maker)	Clocks per Machine Cycle
AT89C51/52 (Atmel)	12
P89C54X2 (Phillips)	6
DS5000 (Dallas Semiconductor)	4
DS89C4x0 (Dallas Semiconductor)	1

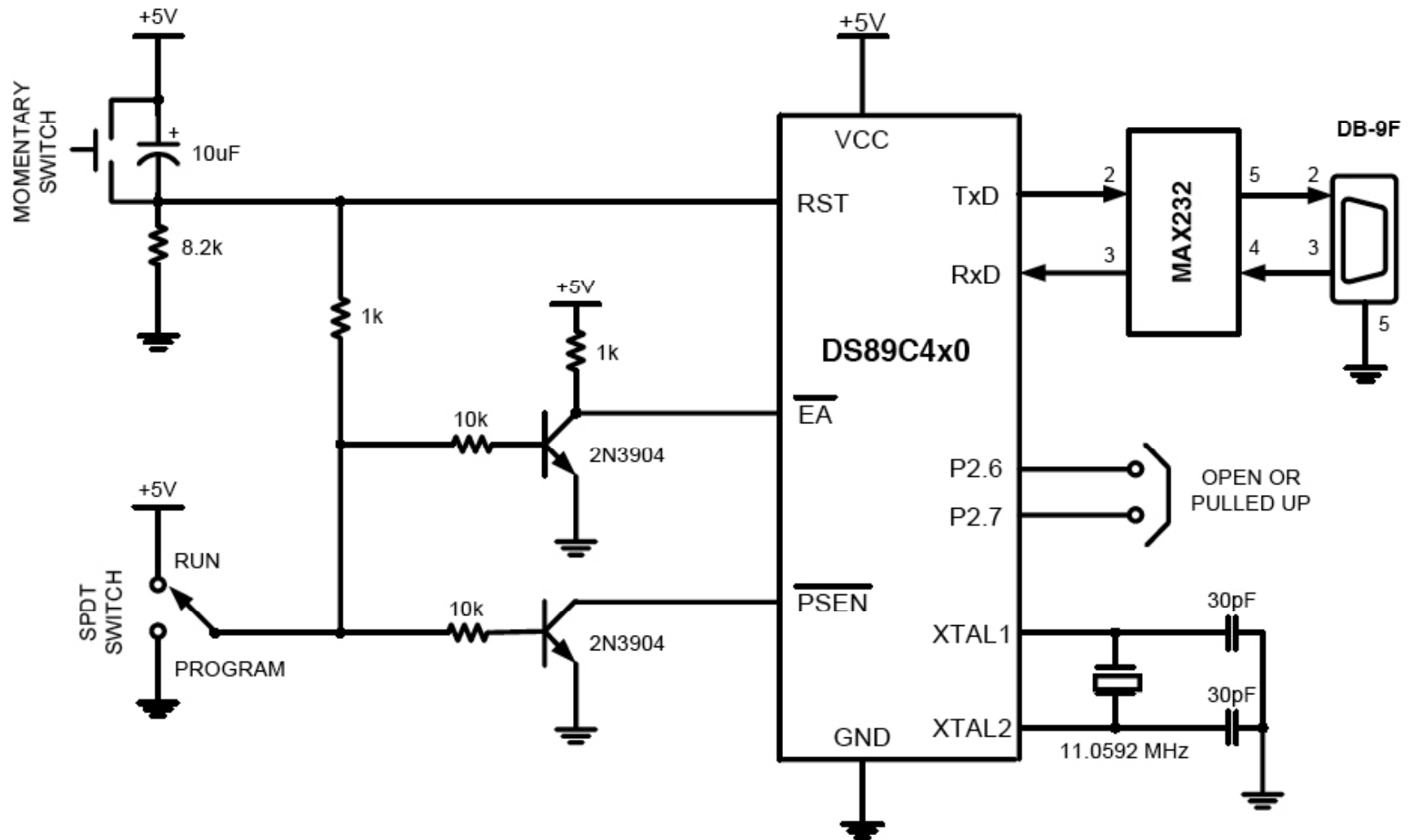
OUTLINE

- Pin description
- **DS89C4x0 HardwareTrainer**
- Intel Hex file

~~**HARDWARE: KEY FEATURES**~~

- **Key features of DS89C4x0**
 - On chip flash ROM
 - DS89C420/30: 16KB
 - DS89C440: 32KB
 - DS89C450: 64KB
 - High speed
 - 1 clock per machine cycle
 - DC to 33 MHz operation (it can be connected to a crystal with freq. 33KMHz)
 - 256 bytes RAM
 - Two full duplex serial ports
 - 13 interrupt sources (6 external) with 5 level of interrupt priority
 - Programmable watchdog timer.

HARDWARE



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- **Intel Hex file**

- A widely used file format designed to standardize the loading of executable machine code into a ROM chip

- Source code $\rightarrow$ Obj file (optional: list file) $\rightarrow$ Absolute file $\rightarrow$ Hex file

linker

Object-to-hex converter

```
:1000000075805575905575A0557DFA111C7580AA9F
:100010007590AA75A0AA7DFA111C80E47C237B4F01
:07002000DBFEDCFADDF62235
:000000001FF
```

- It can be open by using any text editor
- Each line can be decomposed into 4 fields

[illegible]

- Each line starts with a colon
- CC: the number of bytes in this line, the maximum value of 10H
- AAAA: a 16-bit address indicating where the contents of the line should be stored in ROM
- TT: type. If TT=00, then this is not the last line; if TT=01, this is the last line.
- DD...DDD: the real data or code to be stored in ROM
- SS: checksum for everything in the line to make sure there is no error.
- It always ends with FF.

[illegible]

Hex file

[illegible]