8051 Microcontroller: Timers

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EE-309: Microprocessors

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CADSL

8051 Timer/Counter Operation

- Software based
- Hardware based
- Hybrid (Software and Hardware)

Hybrid Approach

- Two 16 bit timer/counter section

  - MOV TL0, #FEH
- TCON Register

TF1	TR1	TF0	TR0	IE1	IT1	IE0	IT0

- TMOD Register

GATE	C/ $\overline{T}$	M1	M0	GATE	C/ $\overline{T}$	M1	M0

Application: Square wave Generator

```
        MOV TMOD, #01
LOOP:   MOV TL0, #0EEH
        MOV TH0, #0FFH
        CPL P1.0
        ACALL DELAY
        SJMP LOOP
DELAY:  SETB TR0
AGAIN:  JNB TF0, AGAIN
        CLR TR0
        CLR TF0
        RET
```

Application: Square wave Generator

```
        ORG 0
        LJMP    MAIN
        ORG 000BH
        CPL P2.0
        RETI
        ORG 0040H
        MOV TMOD, #02H
        MOV TH0, #-92
        MOV IE, #82H
        SETB TR0
AGAIN:  MOV A, P1
        MOV P0, A
        SJMP AGAIN
```

Application: Measurement of Execution Time

- Timers are often used to measure the execution time of a program

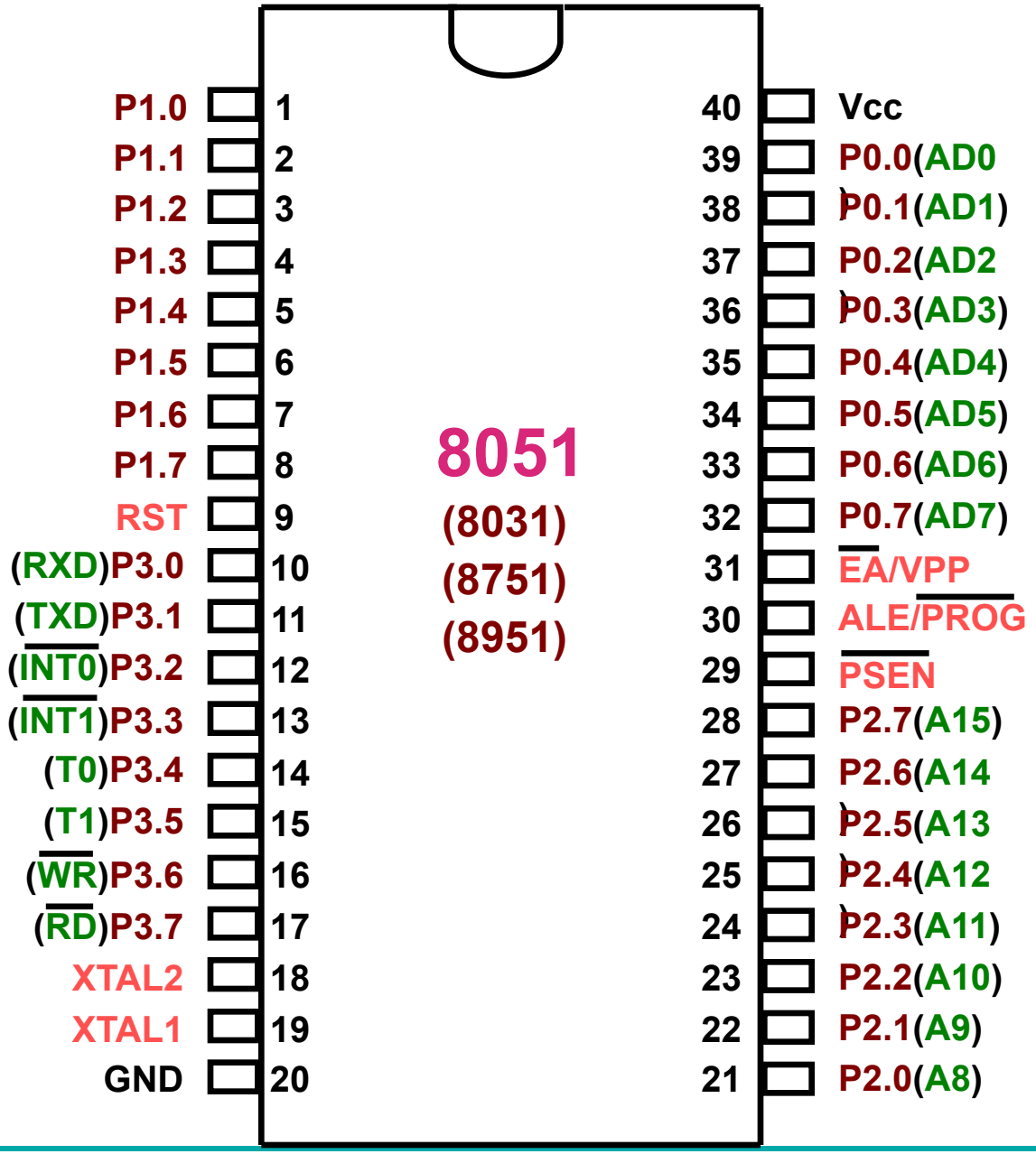
```
ORG 0H
MOV TMOD, #16H ;initialization
SETB TR0          ;starting timer 0
…                 ;main
…                 ;program
CLR TR0           ; stop timer 0
MOV R7, TH0       ; reading timer 0
MOV R6, TL0
```

Application: External Events

- Counting external events on P3-5 and display on P1

```
        MOV  TMOD, #01100000B
        MOV TH1, #0
        SETB P3.5
AGAIN:  SETB TR1
BACK:   MOV A, TL1
        MOV P1, A
        JNB TF1, BACK
        CLR TR1
        CLR TF1
        SJMP AGAIN
```

8051 Pin Diagram



Thank You