微算機原理及應用

單元二： 8051的簡介與架構介紹

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大綱

- 8051的介紹(特性、架構、家族)
- 8051 的暫存器和記憶體(8051 Registers and Memory)
- 8051的接腳(8051 Pins)
- 8051的最簡單線路圖
- 參考文獻(References)

單元二
8051的簡介與架構介紹

PART A

2.1 8051 簡介

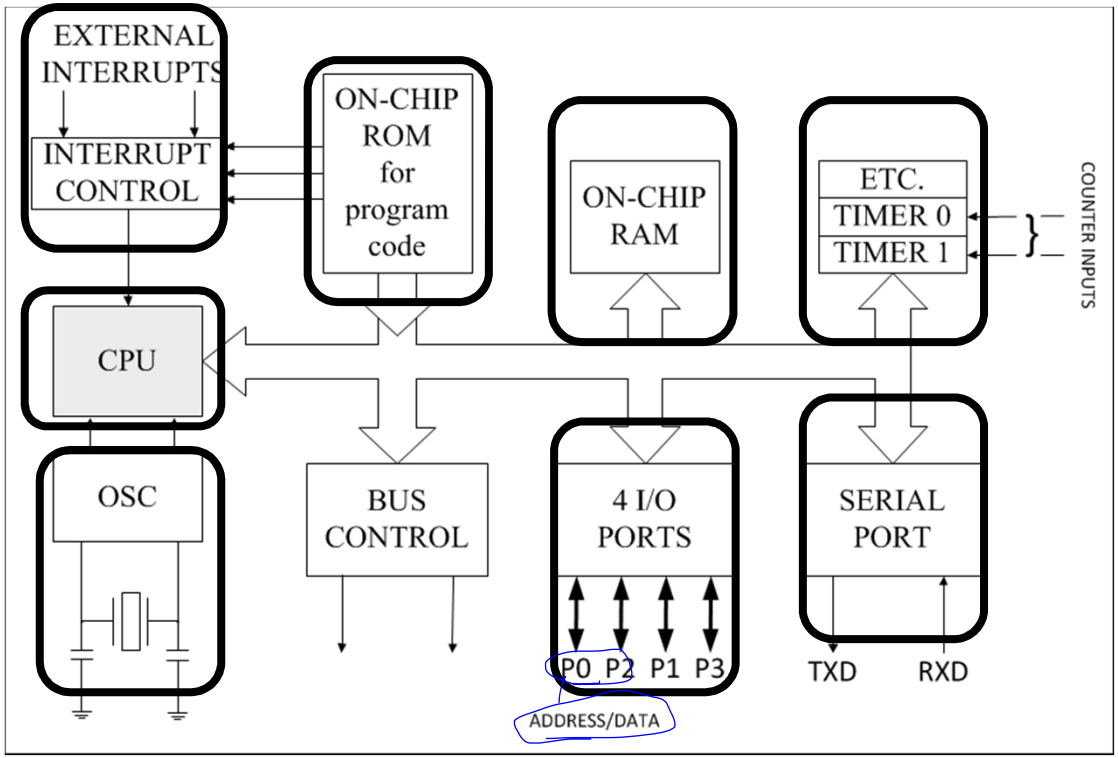
- 1981年, Intel 推出一個 8-bit 的微控制器叫做 8051
- 8051是一個8-bit的處理器，意思是CPU同一時間只能處理 8 bits 的資料
- 8051也可以稱為系統晶片 “system on a chip”

2.2 8051的特性

Feature	Quantity
ROM	4K bytes (on-chip)
RAM	128 bytes
Timer	2
I/O pins	32
Serial port	1
Interrupt sources	6

4ports, 8pins per port.

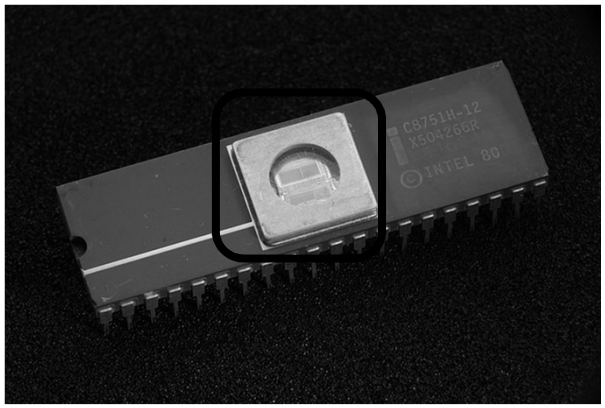
2.3 8051的內部方塊圖

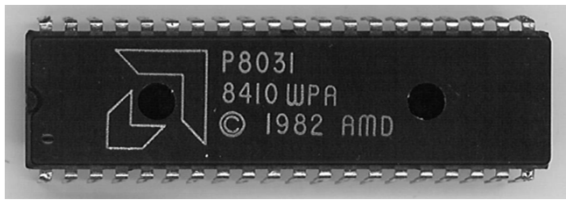


2.4 Intel 8051 家族

Feature	8051	8052	8031	8032	8751	8752
ROM	4K bytes (MASK ROM)	8K bytes (MASK ROM)	0K bytes (No ROM)	0K bytes (No ROM)	4K bytes (EPROM)	8K bytes (EPROM)
RAM	128 bytes	256 bytes	128 bytes	256 bytes	128 bytes	256 bytes
Timer	2	3	2	3	2	3
I/O pins	32	32	32	32	32	32
Serial port	1	1	1	1	1	1
Interrupt sources	6	7	6	7	6	7

2.4 Intel 8051家族(continued)





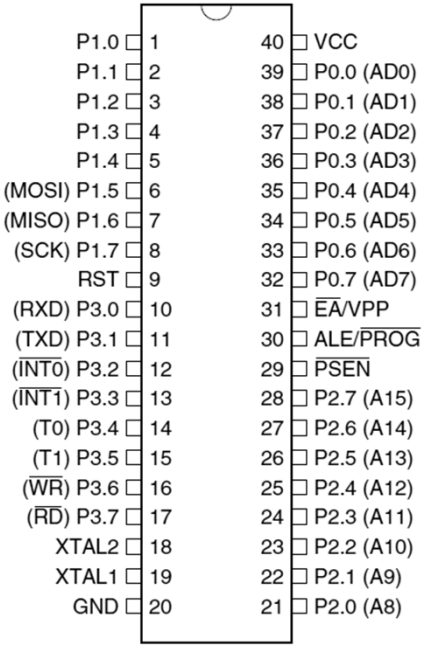
2.5 ATMEL AT89S51

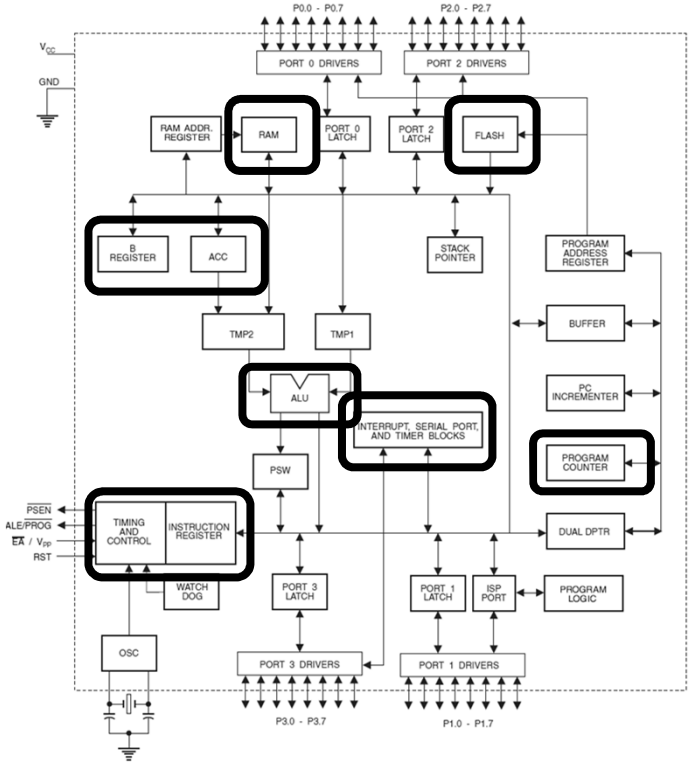
- Intel授權其他廠商智慧財產權核心（IP core）衍生開發的型號

	AT89C51	AT89C52	AT89S51	AT89S52
ROM	4K bytes (Flash)	8K bytes (Flash)	4K bytes (Flash)	8K bytes (Flash)
RAM	128 bytes	256 bytes	128 bytes	256 bytes
Timer	2	3	2	3
I/O pins	32	32	32	32
Serial port	1	1	1	1
Interrupt sources	6	7	6	7

2.6 AT89S51 接腳與方塊圖

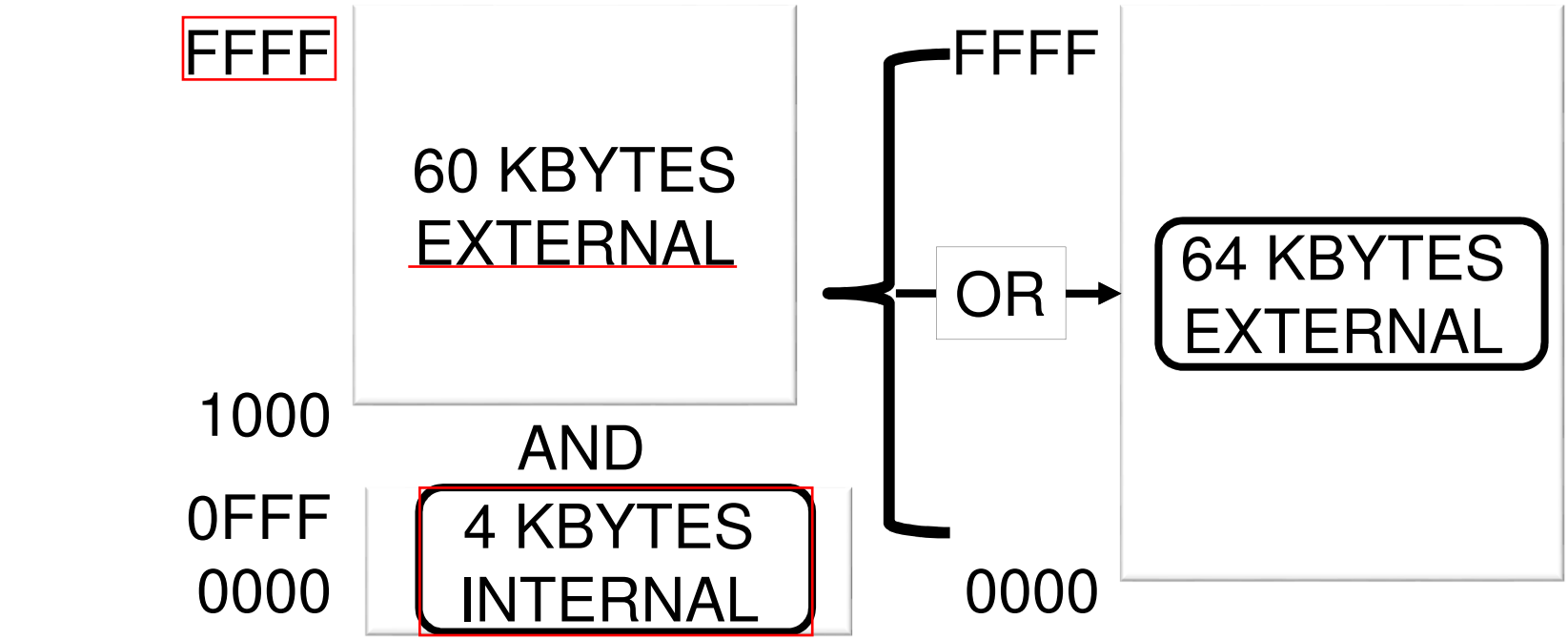
參考資料來源:AT89S51 datasheet



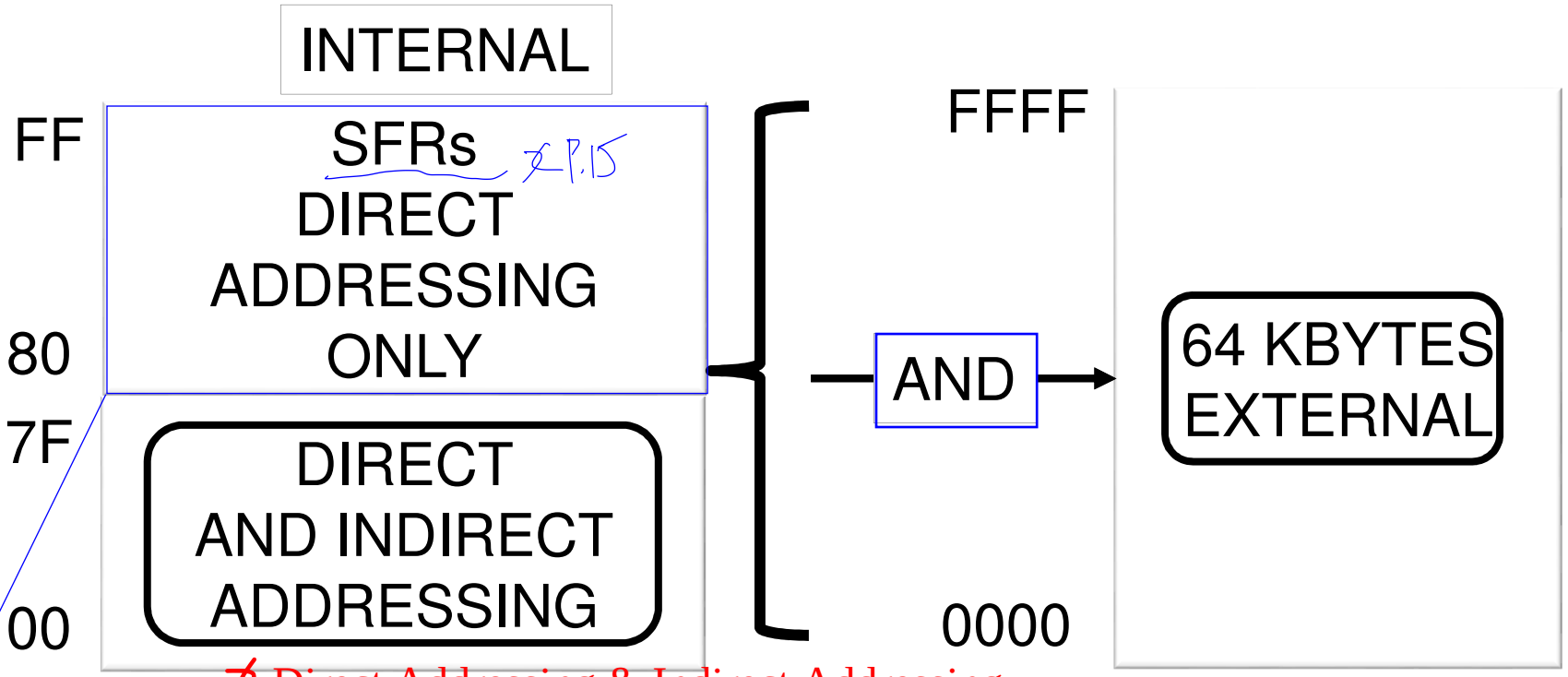


2.7 AT89S51 程式記憶體 ROM

16 address lines



2.8 AT89S51 資料記憶體 RAM



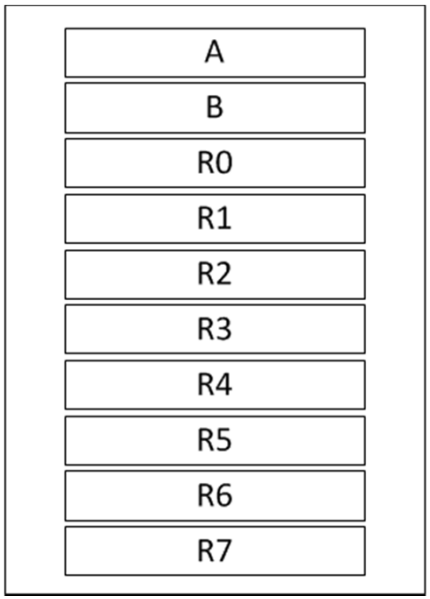
不算是 Data RAM 的一部分

Direct Addressing & Indirect Addressing

Unit3 8051的組合語言程式設計 修改1110.pdf, P.7

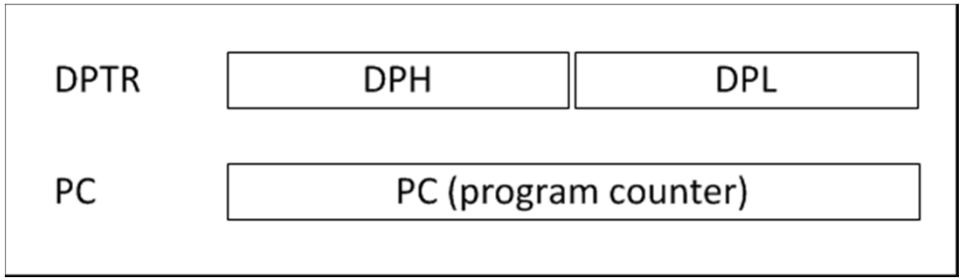
單元二
8051的簡介與架構介紹
PART B

2.9 8051 暫存器



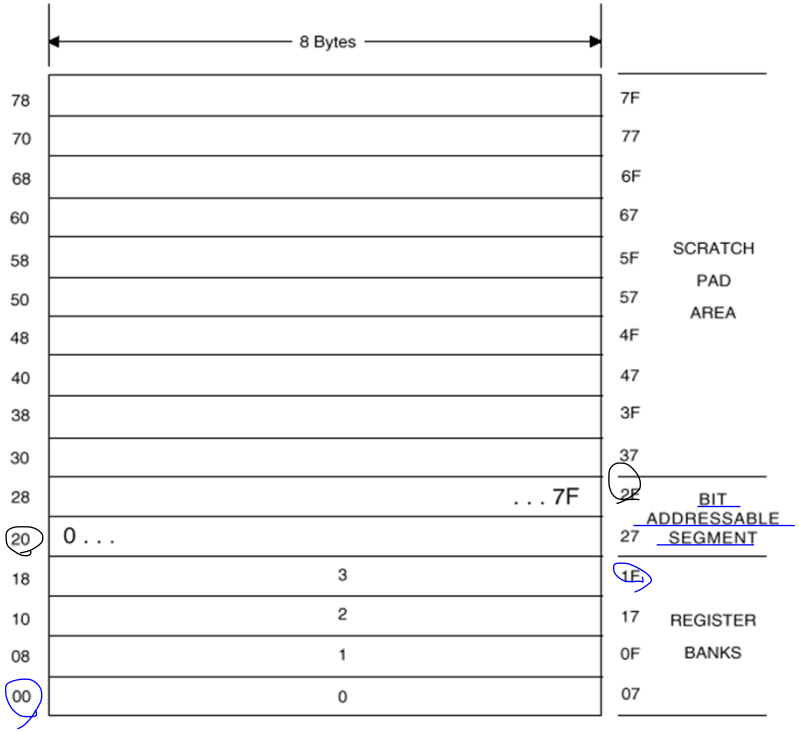
Some 8-bit Registers of 8051

two of the special function register



Some 16-bit Registers of 8051

2.10 可直接與間接定址的RAM



2.11 AT89S51特殊功能暫存器

Special Function Registers (SFR) Map

	Bit Addressable	8 Bytes Non-bit Addressable							
F8h									FFh
F0h	B								F7h
E8h									EFh
E0h	ACC								E7h
D8h									DFh
D0h	PSW								D7h
C8h	(T2CON)		(RCAP2L)	(RCAP2H)	(TL2)	(TH2)			CFh
C0h									C7h
B8h	IP								BFh
B0h	P3								B7h
A8h	IE								AFh
A0h	P2								A7h
98h	SCON	SBUF							9Fh
90h	P1								97h
88h	TCON	TMOD	TL0	TL1	TH0	TH1	AUXR	CKCON	8Fh
80h	P0	SP	DPL	DPH				PCON	87h
	0/8	1/9	2/A	3/B	4/C	5/D	6/E	7/F	

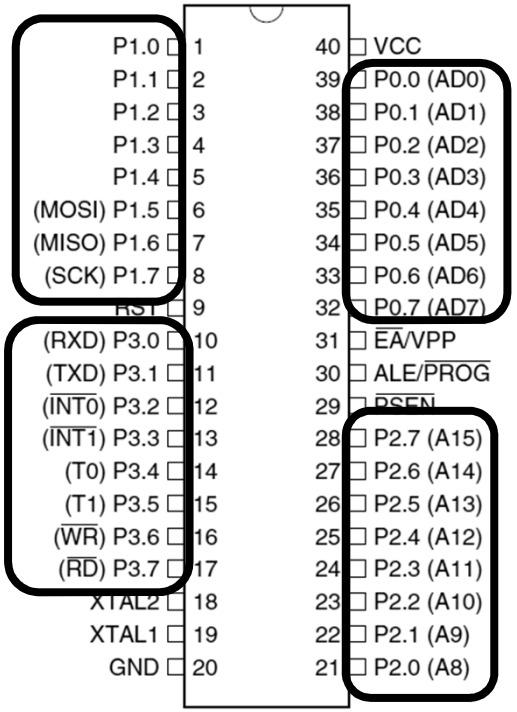
Note: Reserved

Text version:
2.2 Special Function Registers, Atmel 8051 Microcontrollers Hardware Manual.pdf, P.68(2-68)

參考資料來源:
ATMEL 8051 Microcontrollers Hardware Manual

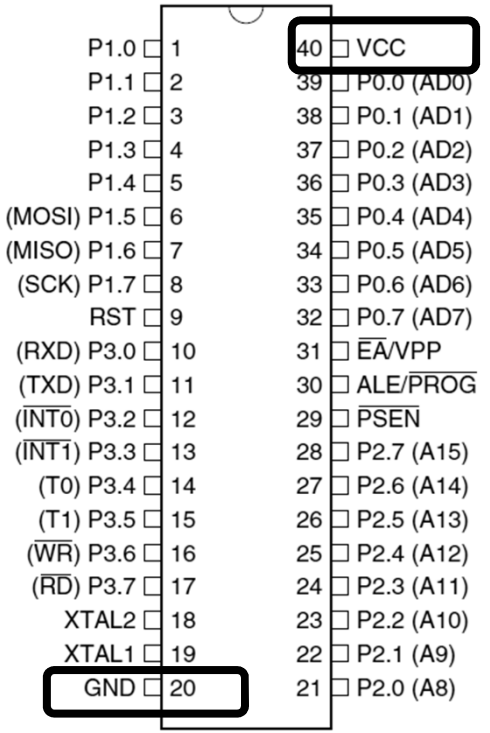
2.12 8051 接腳

- There are a total of four ports for I/O operations
- A total of 32 pins are set aside for the four ports P0, P1, P2, and P3
- Each port takes 8 pins



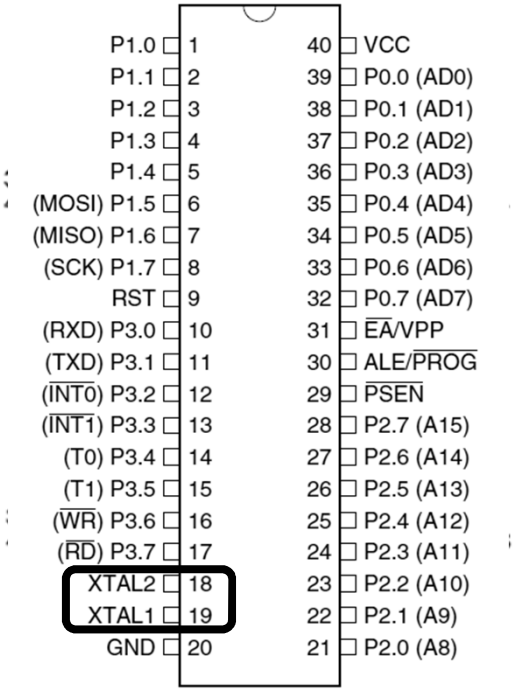
2.12 8051接腳 (continued)

- V_{CC}
  - Pin 40 provides supply voltage to the chip. The voltage source is +5V.
- *GND*
  - Pin 20 is the ground.



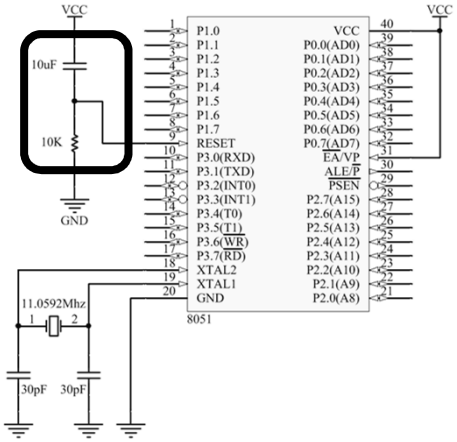
2.12 8051接腳 (continued)

- *XTAL1 and XTAL2*
  - The 8051 has an on-chip oscillator but requires an external clock to run it. Most often a quartz crystal oscillator is connected to inputs XTAL1 (pin 19) and XTAL2 (pin 18).

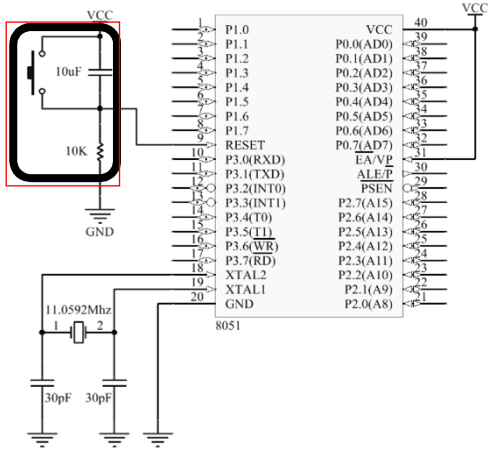


2.12 8051接腳 (continued)

- *RST*
  - Pin 9 is the RESET pin. It is an input and is active high (normally low).



Power-ON RESET Circuit

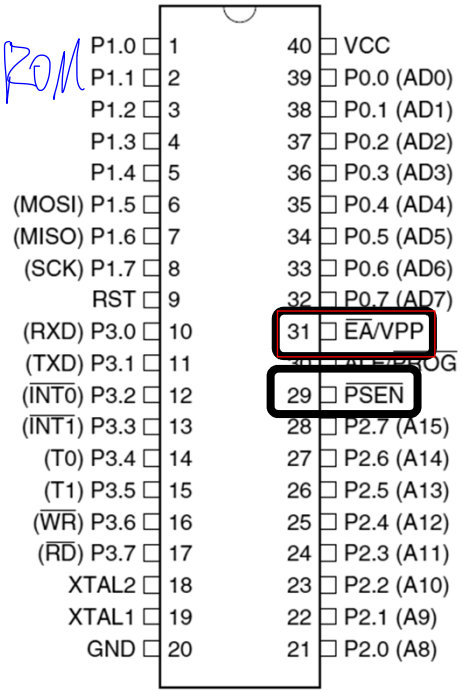


Power-ON RESET with Momentary Switch

2.12 8051接腳 (continued)

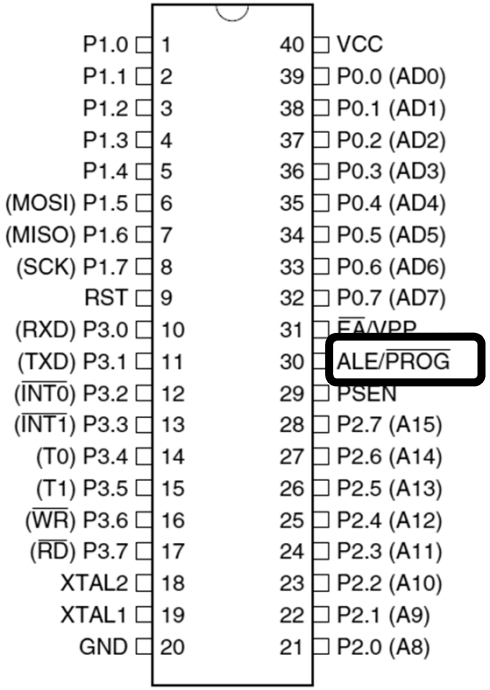
EA should be strapped to VCC for internal program executions

- $\overline{EA}$ Enable the usage of external programming ROM
  - which stands for “external access,” is pin number 31 in the DIP packages.
- $\overline{PSEN}$
  - Program Store Enable (PSEN) is the read strobe to external program memory.

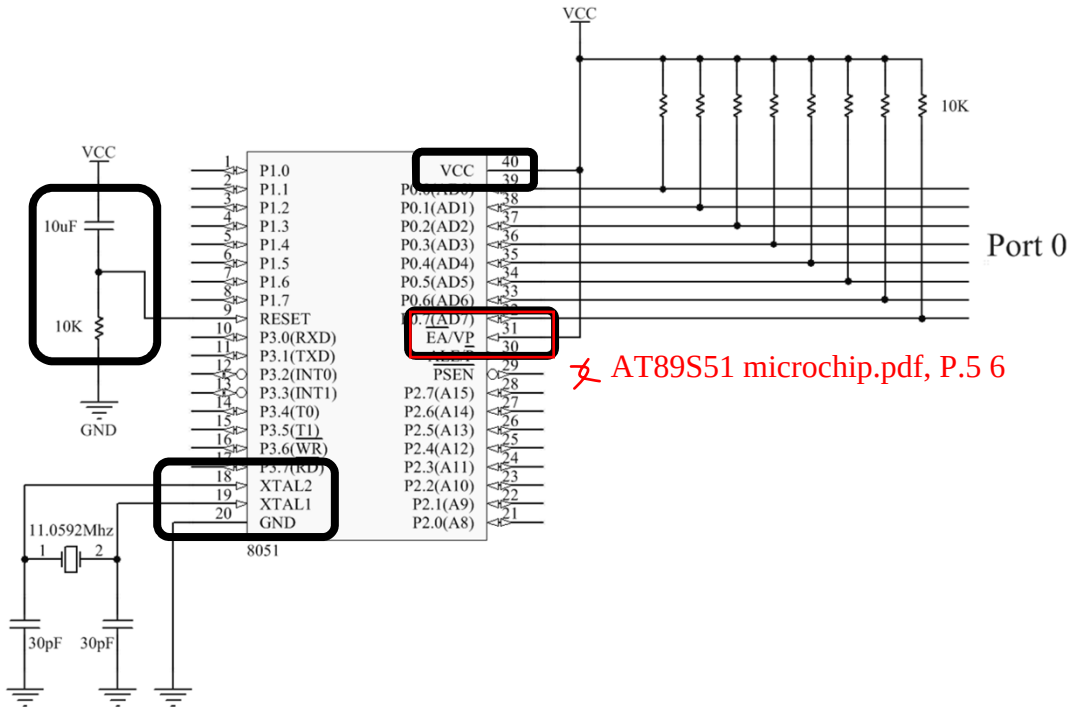


2.12 8051接腳 (continued)

- *ALE*
  - Address Latch Enable (ALE) is an output pulse for latching the low byte of the address during accesses to external memory programming.



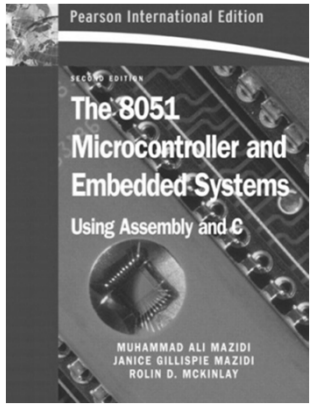
2.13 89C51/52-based 系統的最簡單線路



AT89S51 microchip.pdf, P.5 6

2.14 參考文獻

- ATMEL AT89S51 datasheet (doc2487.pdf)
- ATMEL 8051 Microcontrollers Hardware Manual (doc4316.pdf)
- ATMEL 8051 Microcontroller Instruction Set (doc0509.pdf)
- The 8051 Microcontroller and Embedded Systems Using Assembly and C, Second Edition, by Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay.



2.15 複習題

- 8051的內部有哪些功能方塊?
- 8051內部有多大的ROM?
- 8051內部有多大的RAM?
- 8051內部有哪些暫存器?
- 甚麼是SFR?
- 8051有幾個IO port?
- 8051的最簡單線路圖?