Chapter 7

Peripheral ICs and their Interfacing

Lesson 6

DAC - Digital to Analog Converter

Outline

- **Digital to Analog Converter**
- DAC0808
- DAC Pins Programming

Digital to Analog Conversion (DAC)

- Analog input needed after conversion of the bits in many applications
- Digital bits at input generate a proportional analog output in DAC
- A reference input (Vref+) defines the maximum analog output (when input bits = all 1s) and Vref- the minimum output (when input bits= all 0s).

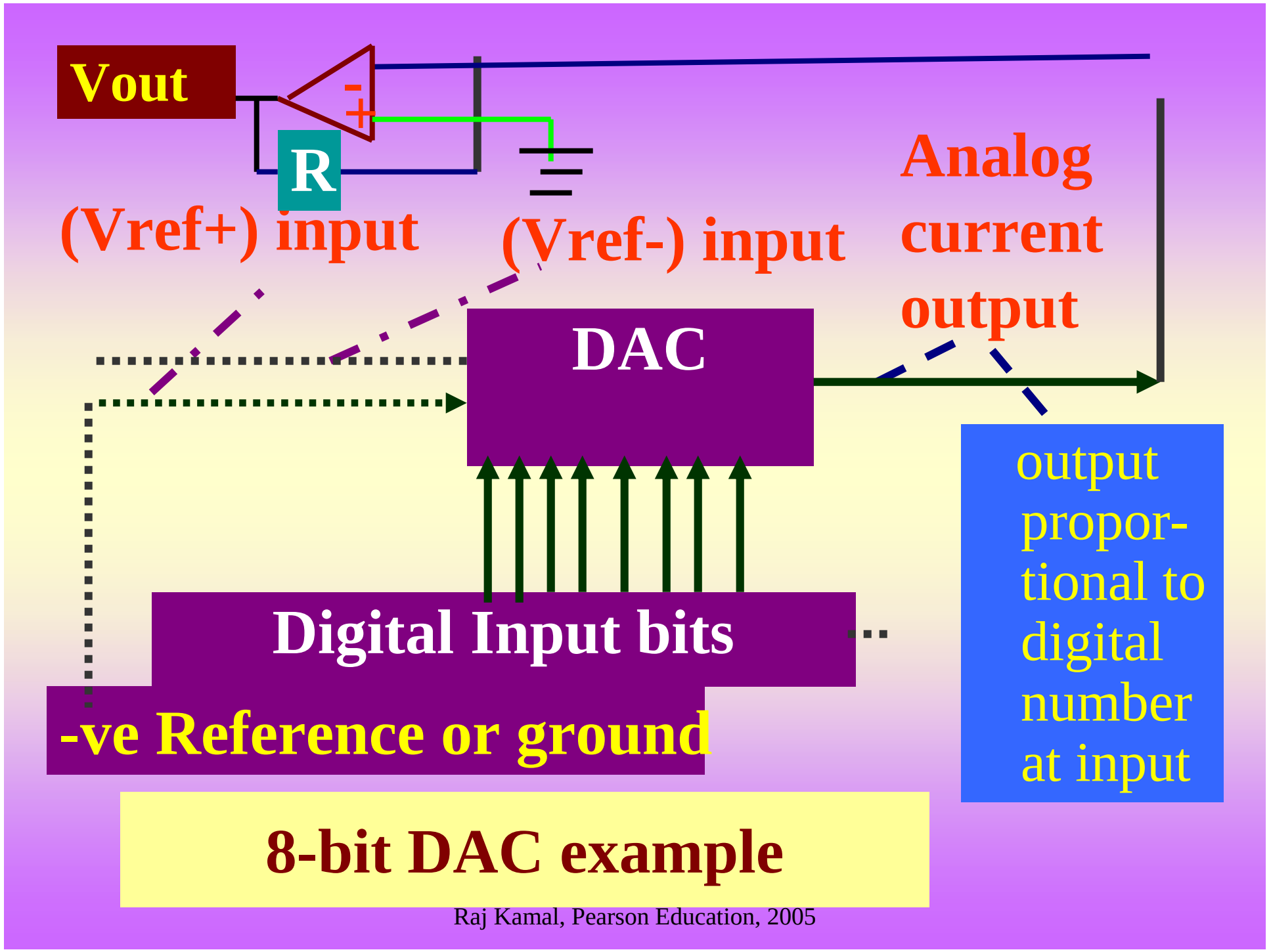
DAC output

- n-bit DAC analog output =

$$\frac{\text{Digital input number} * (V_{ref+} - V_{ref-})}{\{(2^n) - 1\}}$$

8-bit DAC example

- **Therefore, 8-bit DAC functions as follows. Let (Vref+) = 1.275 V and (Vref-) = 0 V.**
- **Input bits = all 0s = 00000000 (=0d) then output = 0V,**
- **Input bits = 10000000 (= 128d) then output = 0.64V and**
- **Input bits = 11111111 (= 255d) then output = 1.275V**


Vout
R
(Vref+) input
(Vref-) input
Analog current output
DAC
output proportional to digital number at input
Digital Input bits
-ve Reference or ground
8-bit DAC example

DAC Built in at MCU Examples

- Most MCUs has PWM(s) unit,an operational amplifier integrator then generates desired output
- 80535 has PWM
- MC68HC11N4 has two channels DAC. DCON register enables/disables DAC outputs, DA1 and DA2 are 8-bit data registers for the channels

DAC Chips for interfacing processors buses and MCUs ports

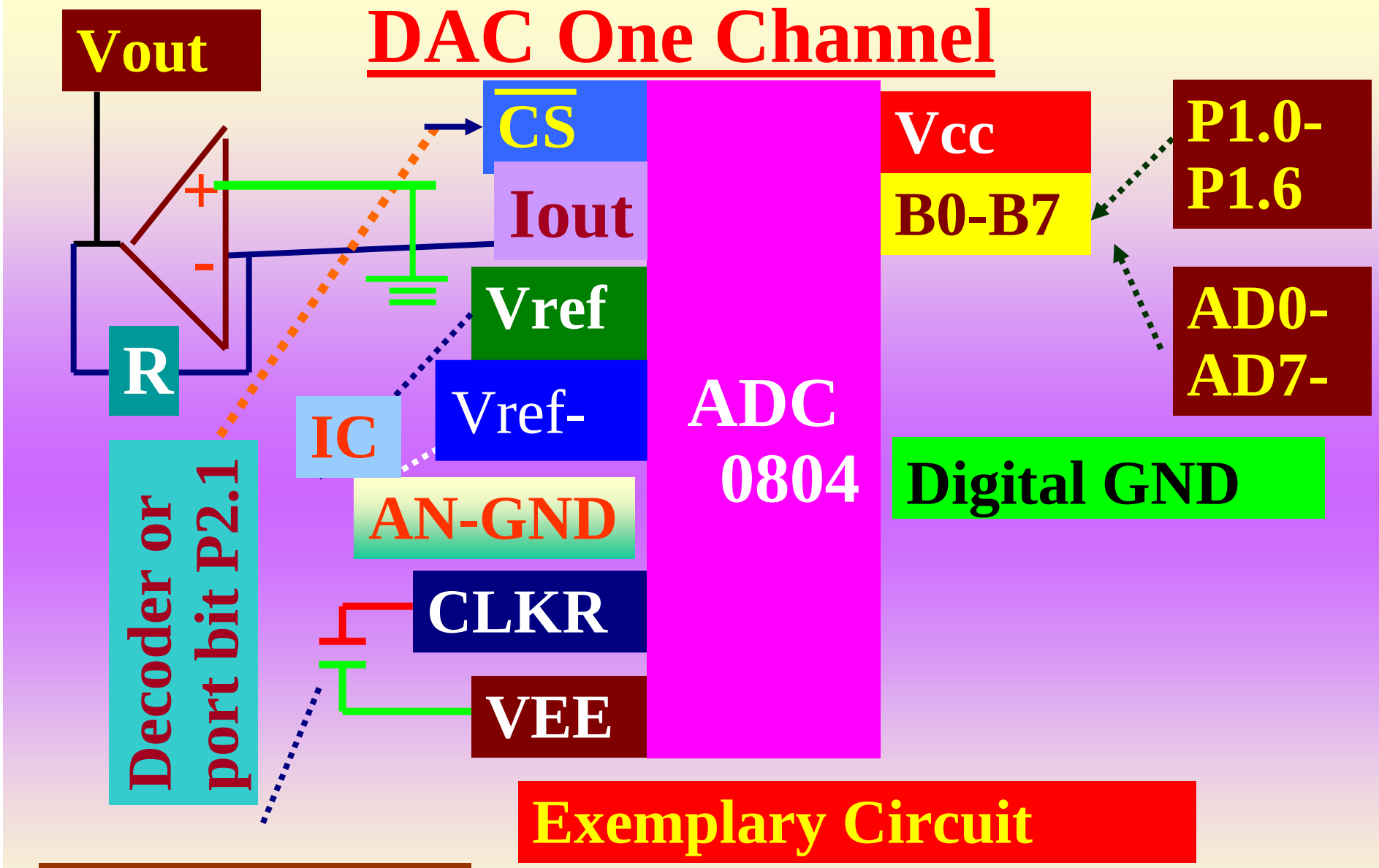
- DAC 808 one channel DAC with voltage references +and -ve analog inputs
- M1408 is one channel DAC

Considerations when using an DAC

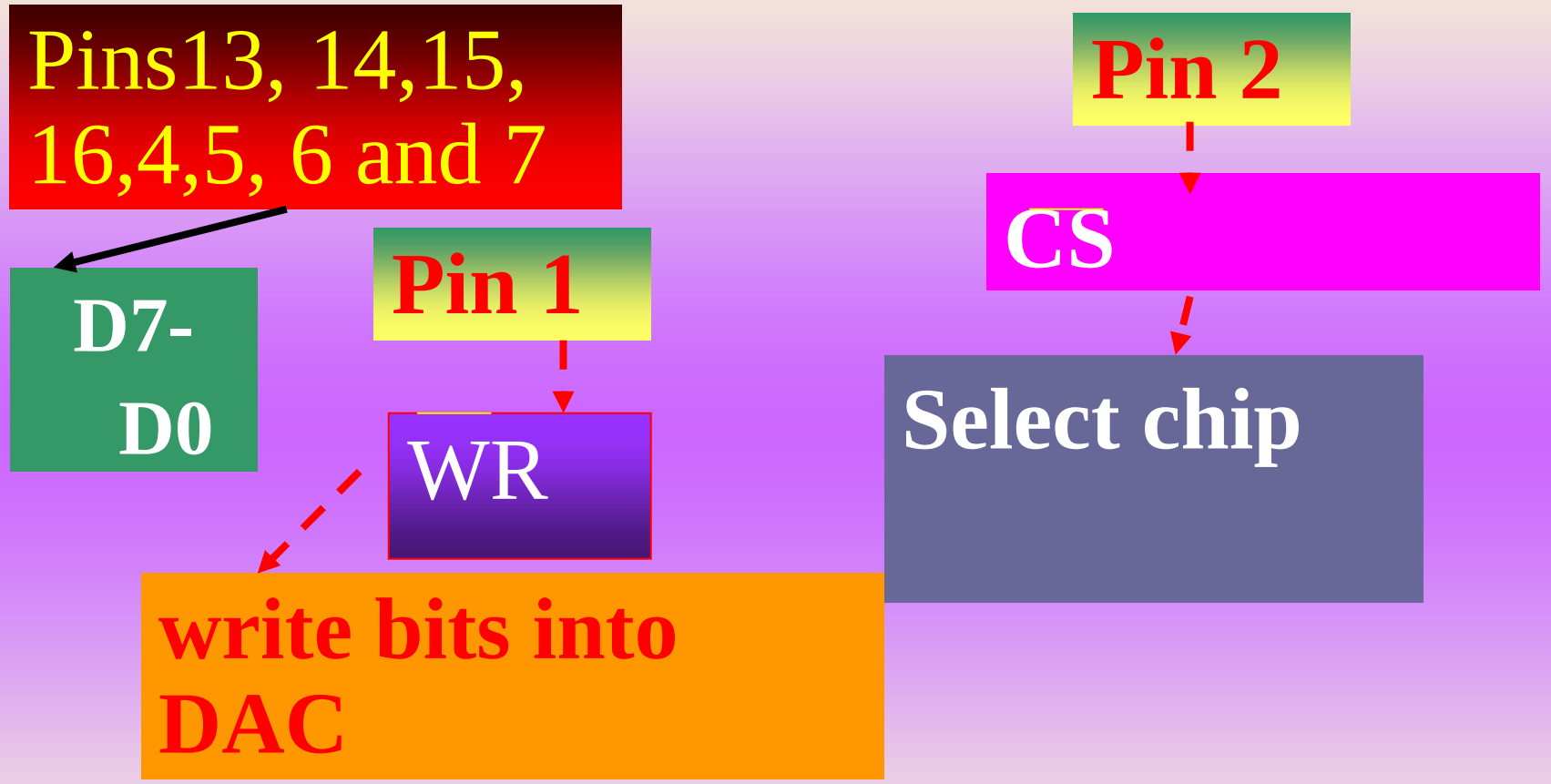
- Number of bits, reference (single or dual programmable or non programmable), conversion accuracy,separate analog ground
- Interfacing operational amplifier
- Conversion rate and data input rate
- CMOS or Bipolar based

Outline

- Digital to Analog Converter
- **DAC0808**
- DAC Pins Programming

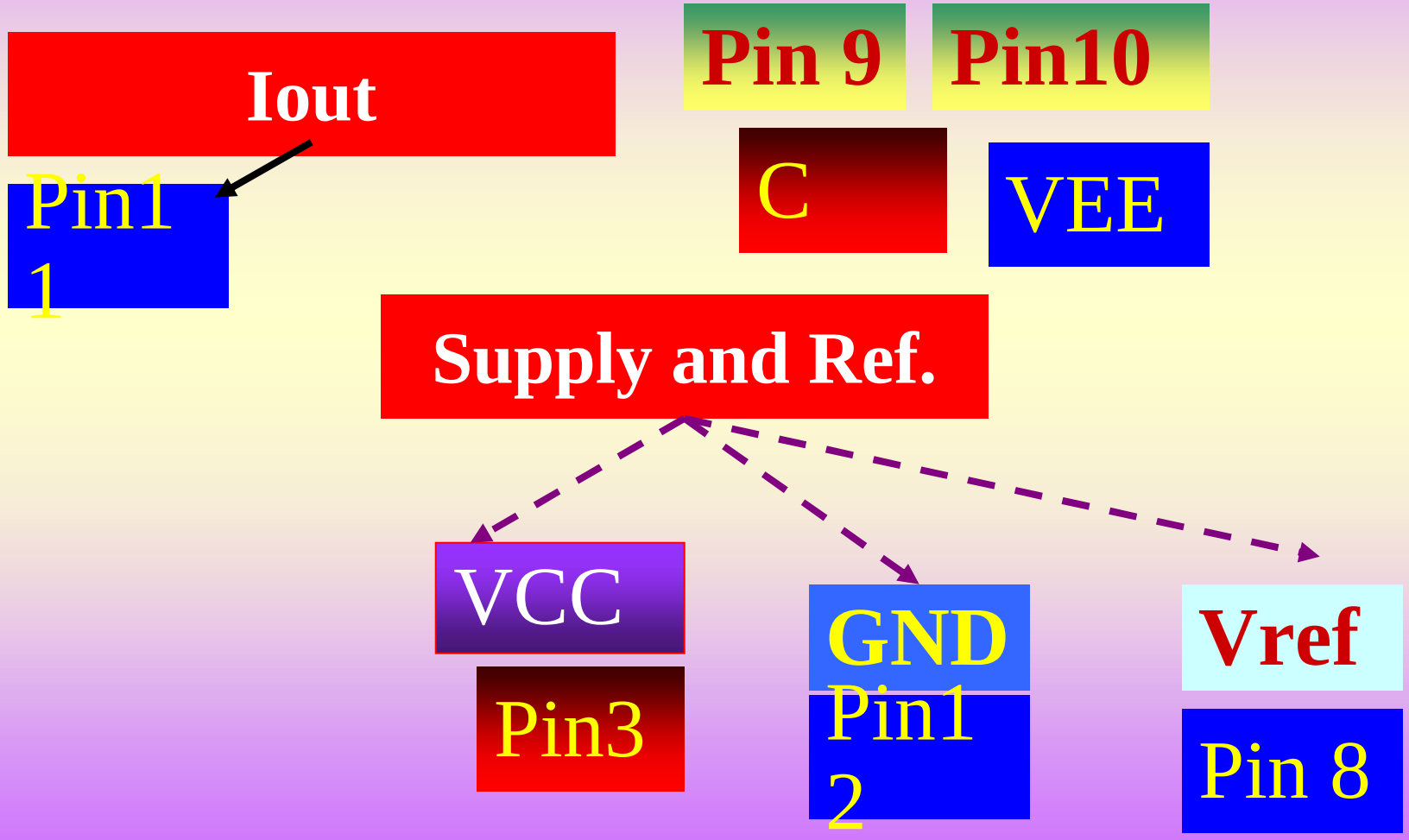

DAC One Channel
Vout
CS
Iout
Vref
Vref-
IC
AN-GND
CLKR
VEE
Vcc
B0-B7
P1.0-
P1.6
AD0-
AD7-
ADC
0804
Digital GND
R
+
-
Decoder or
port bit P2.1
Exemplary Circuit
Comparator

Pins DAC 808



Refer Table7.22

DAC Pins


Iout
Pin1
1
Pin 9
Pin10
C
VEE
Supply and Ref.
VCC
Pin3
GND
Pin1
2
Vref
Pin 8

Outline

- Digital to Analog Converter
- DAC0808
- **DAC Programming**

1.Initial condition P2.6 = 1,A= 00

2.Select DAC write P2.1 (CS) = 0

3. MOV P1, A; Apply DAC input

4.Delay:T/256

5. INC A;

6. Step 3

Summary

DAC 808

- Digital 8bits to analog output
- 16 Pins
- Interface with processor buses or MCU ports

End of Lesson 6

DAC - Digital to Analog Converter

THANK YOU