Embedded Systems Interfacing

Digital Input Output

Interfacing LEDs

LED Definition

Light Emitting Diode is an electrical element that emits light by supplying a voltage difference between its terminals

LED Connection:

The LED has two pins, positive and negative one.
In your kit there are 8 LEDs all of them are common ground..

LAB 1

Write a C code to turn on LED on Pin A0

Time To Code

Using Delay

Busy Loop Delay

"NOP" Assembly instruction which means " No Operation" and you can write assembly instructions inside the C code like that:

```
asm("NOP");
```

Note

You must determine the system clock.

LAB 2

Write a C code to turn on LED on Pin A0 for 1 second and then turn it off.

Time To Code

LED Blinking

LED Blinking Algorithm

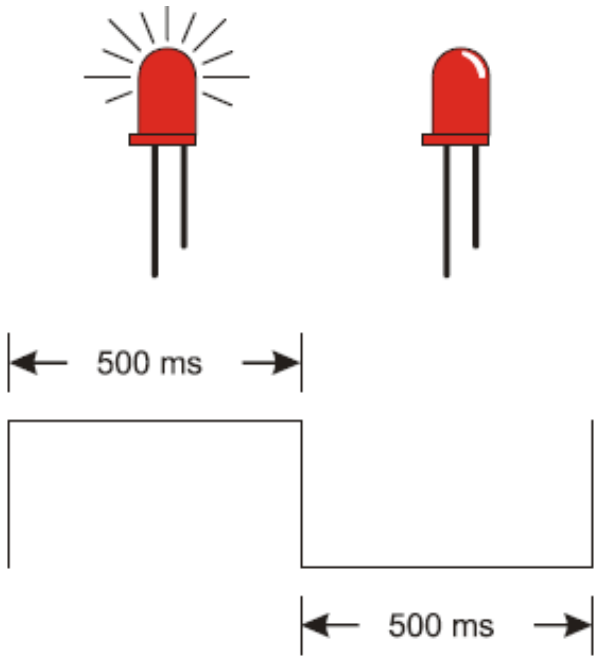
```
/* Loop forever */
while (1)
{
   /* Turn LED on */

   /* Apply 0.5 Second Delay */

   /* Turn LED off */

   /* Apply 0.5 Second Delay */

}
```



LAB 3

Write a C code to blink a LED Every 1 second

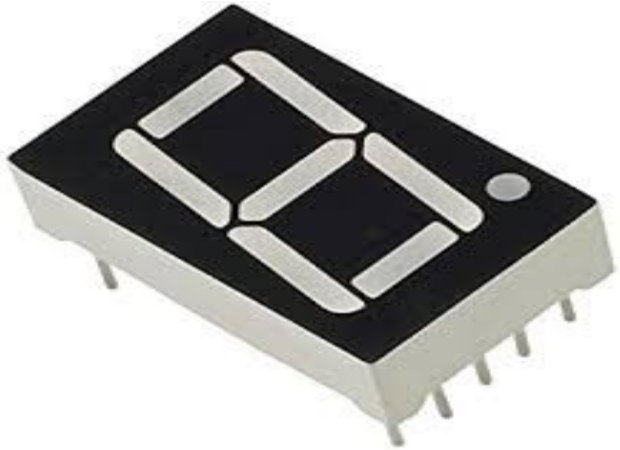
Time To Code

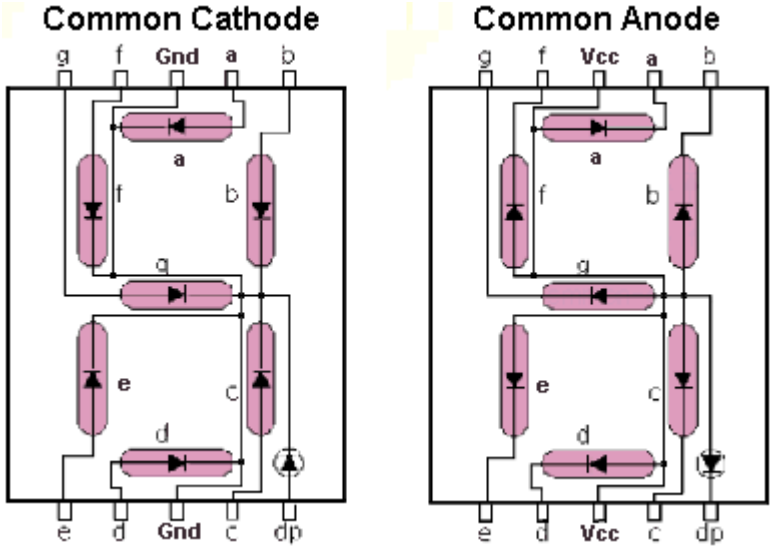
LAB 4

Write a C Code that apply Some LED animations

Time To Code

Interfacing 7-Segments



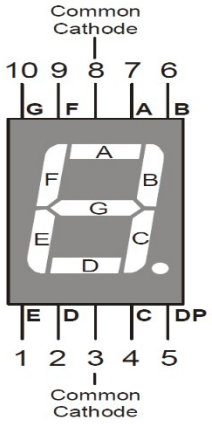


Interfacing 7-Segments

Coding of 7-Segments :

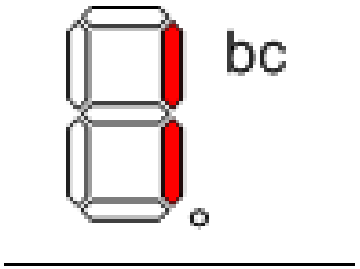
7–segment is common cathode :

Assuming Connecting the 7-Segment lines (a to g) to PA0 to PA6 in the microcontroller kit



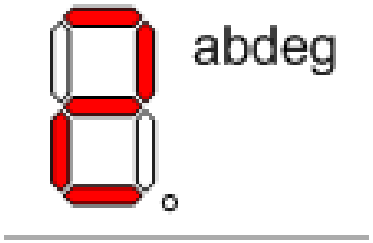
Set second and third pin in PORTA to carry 5v.

output on 7-segement



Set A0 , A1 , A3 , A4 & A6 in PORTA to carry 5v that connected by A,B,D,E,G

output on 7-segement



7-Segment Truth Table

s	BCD	G	F	E	D	C	B	A
0	0000	0	1	1	1	1	1	1
1	0001	0	0	0	0	1	1	0
2	0010	1	0	1	1	0	1	1
3	0011	1	0	0	1	1	1	1
4	0100	1	1	0	0	1	1	0
5	0101	1	1	0	1	1	0	1
6	0110	1	1	1	1	1	0	1
7	0111	0	0	0	0	1	1	1
8	1000	1	1	1	1	1	1	1
9	1001	1	1	0	1	1	1	1

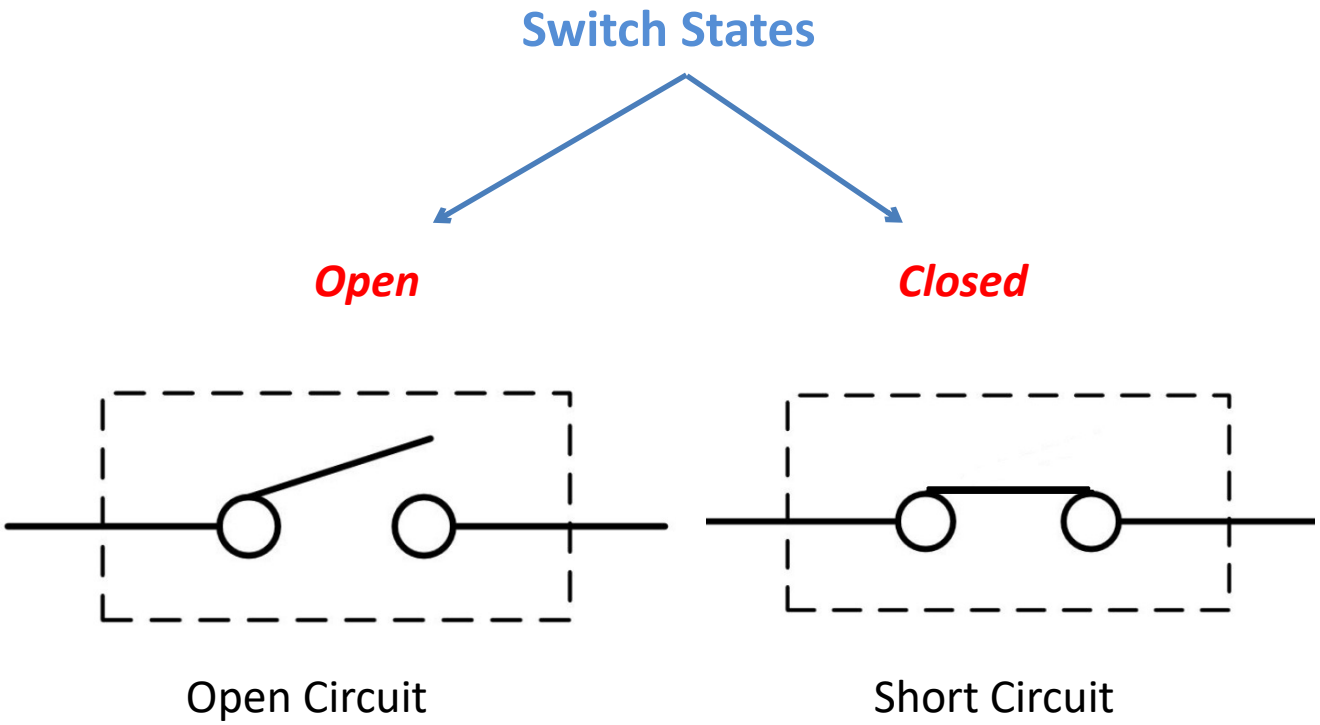
LAB 5

write a code to display on 7-segement numbers from 0 to 9 with delay 1 second before changing number.

Time To Code

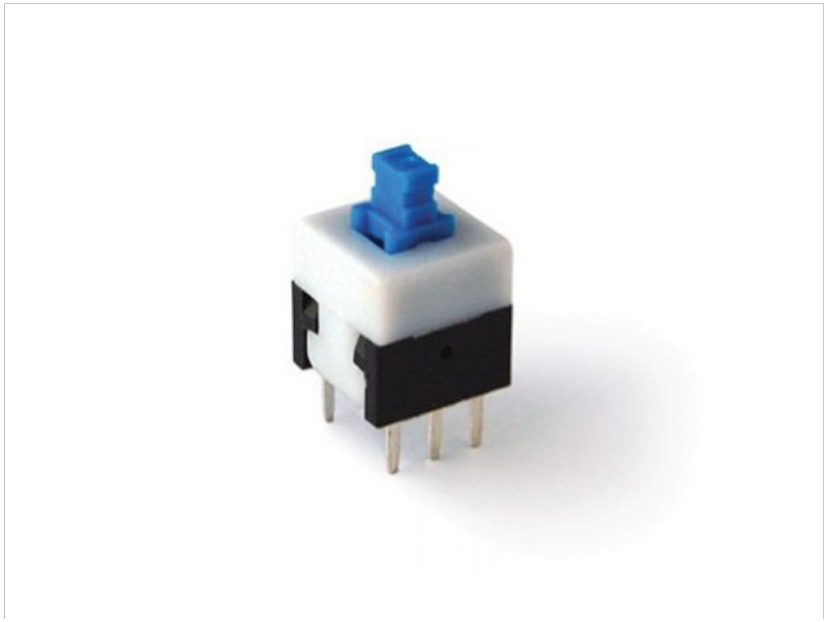
Mechanical Switch

Mechanical switch
is an electrical component that can connect or break an electrical circuit.



Tactile switch

Push Button

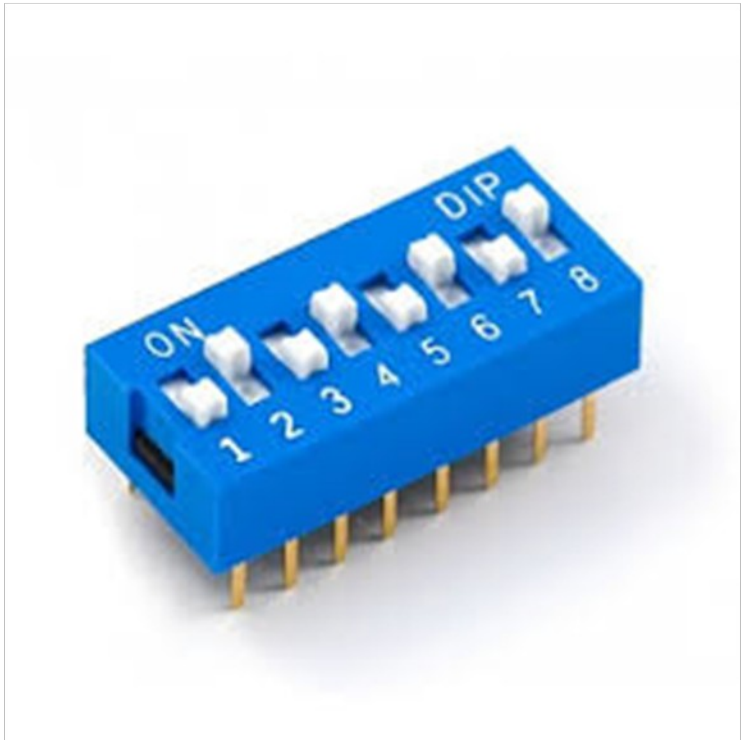


Paddle Switch

Rocker Switch

Toggle Switch

DIP Switch



Thumbwheel Switch

Limit Switch

Slide Switch

Rotary Switch

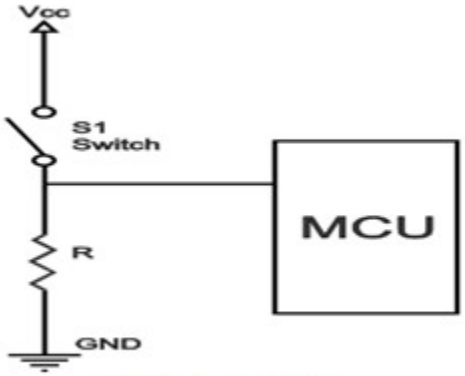
Reed Switch

Knife Switch

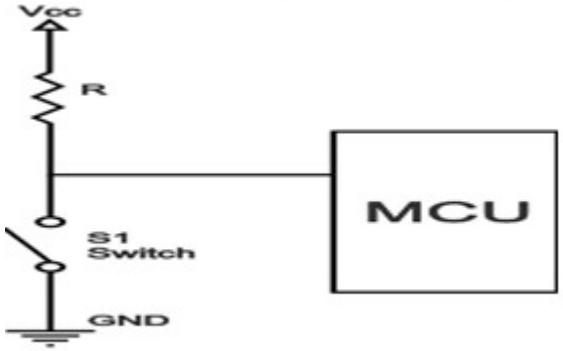
Key Switch

Interfacing Mechanical Switch

Switch shall be connected by pull up or pull down resistor to avoid short circuits.



Pull-down resistor



Pull-up resistor circuit

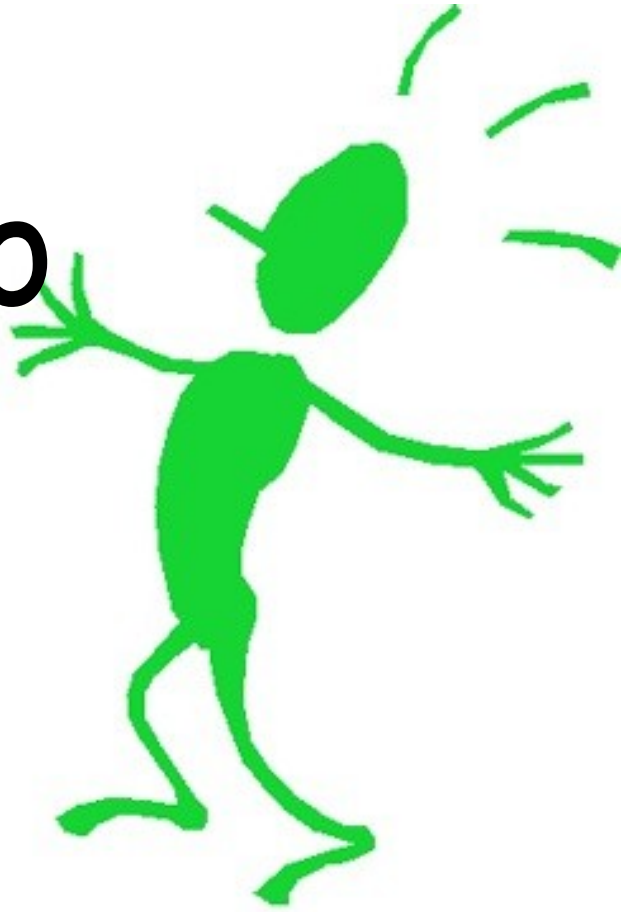
LAB6

Write a code that uses a switch to control a string of 8 LEDs. When the switch is On the LED string shall be flashing every 500 ms. When the switch off the LED string shall be also off.

Time To Code

The End …

Any questions … ?



Assignment 1

Write a C code that simulate the traffic lightening system:
1- Turn On Green LED for 10 seconds
2- Turn On Yellow LED for 3 seconds
3- Turn On Red LED for 10 seconds
4- Apply these forever while counting the seconds down on a 2 7-segment displays.

Assignment

Write a C code that apply 8 different animations on 8 LED string based on the value of 3 way DIP Switch as following:

DIP value	LED Action
1	Flashing every 500 ms
2	Shifting Left every 250 ms
3	Shifting Right every 250 ms
4	2-LEDs Converging every 300 ms
5	2-LEDs Diverging every 300 ms
6	Ping Pong effect every 250 ms
7	Incrementing (Snake effect) every 300 ms
8	2-LEDs Converging/Diverging every 300 ms

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