

General Purpose Input Output

(GPIO)

A diagram consisting of a large blue triangle on the left and three stacked, rounded rectangular boxes on the right. The boxes are white with a blue border and a light blue diagonal shadow. They are positioned to the right of the triangle, with the top box at the top of the triangle's height, the middle box in the middle, and the bottom box at the base. Each box contains a red text label.

Reading digital signals

Issuing interrupts

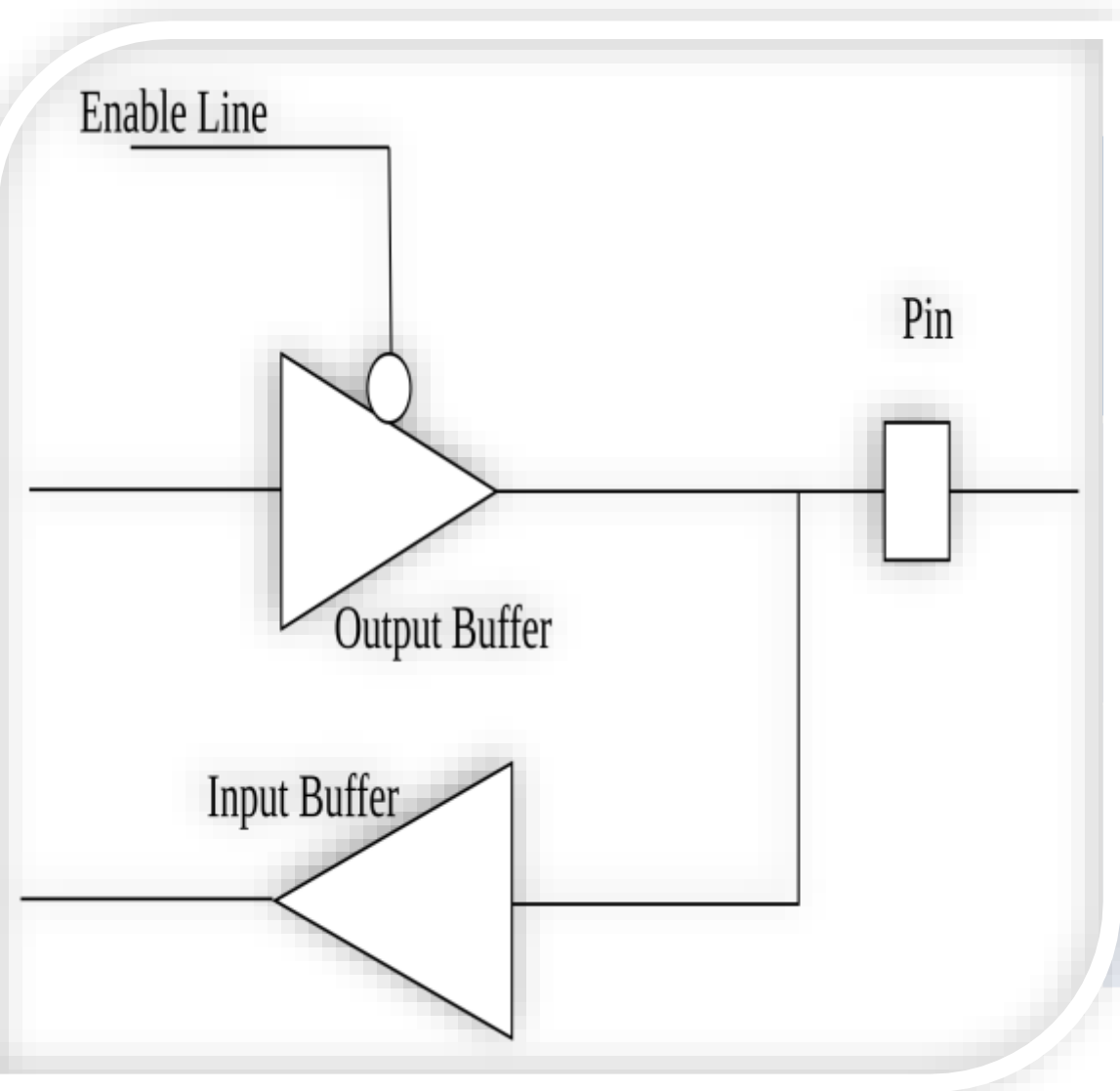
Generating triggers for
external components

GPIO pin

- Generic pin whose value consists of one of two voltage settings (*high* or *low*)
- Behavior can be programmed through software

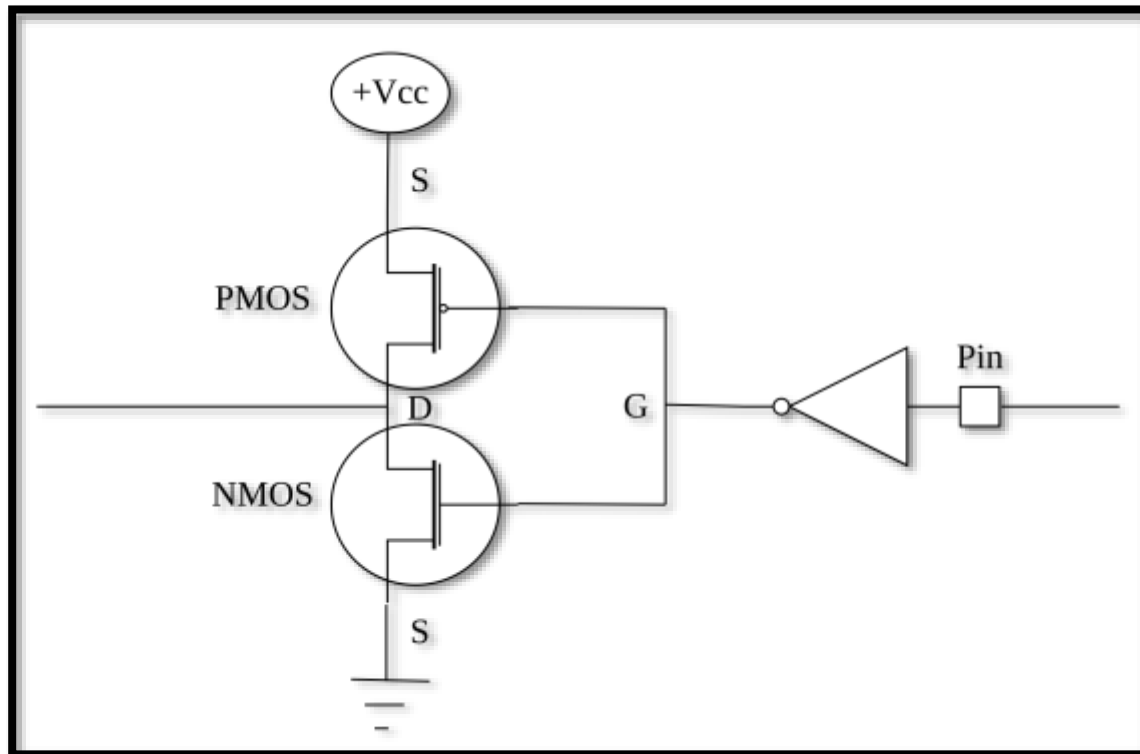
GPIO port

- Platform-defined grouping of GPIO pins (STM32 16 pins).

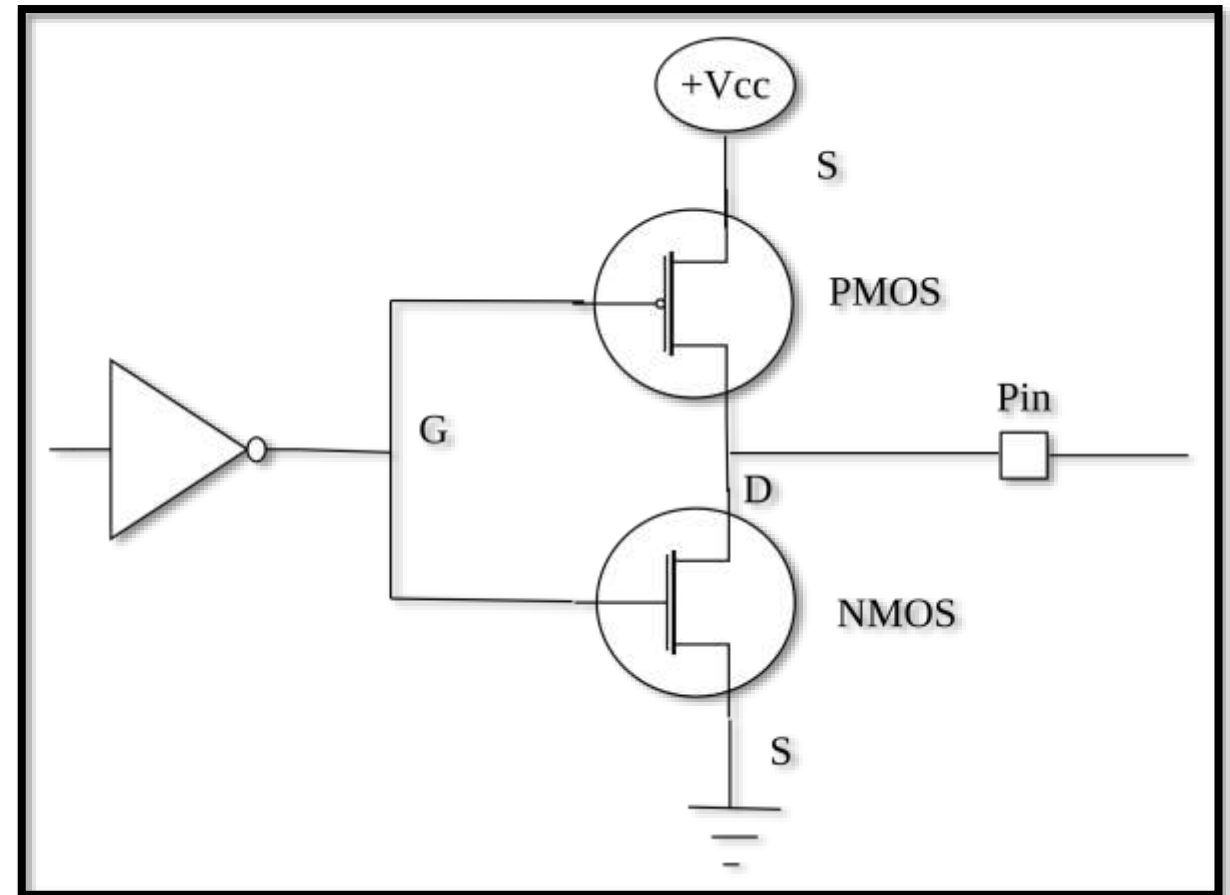


Enable Line	Output buffer	Input buffer
1	✓	✗
0	✗	✓

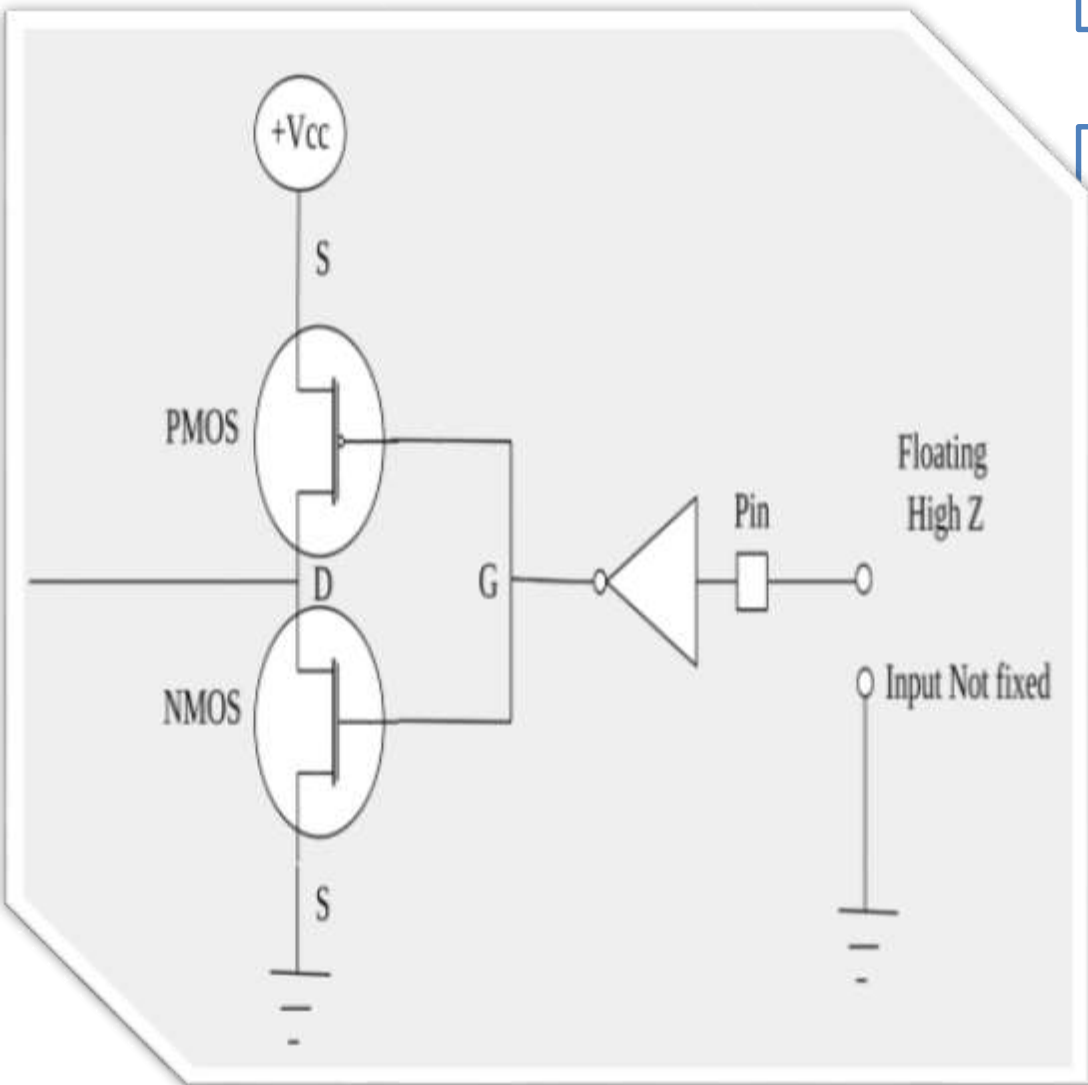
Input Buffer



Output Buffer



GPIO input mode with high impedance state



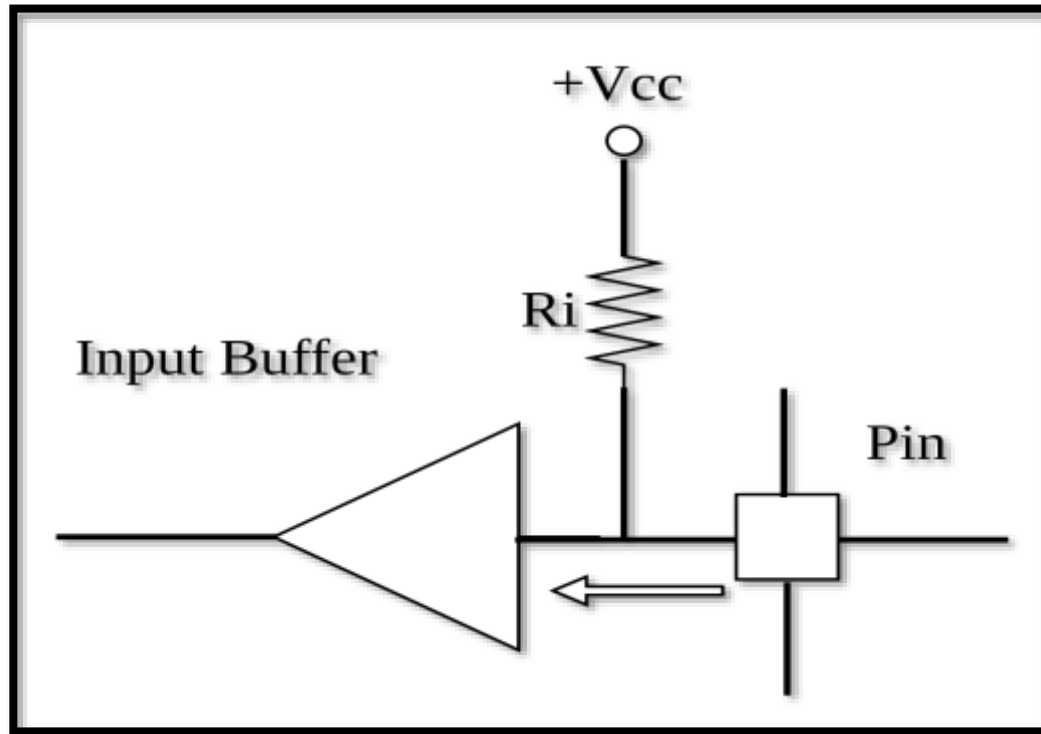
After reset MCU default GPIO pins are Input Mode

Default GPIO pins will be in High Z state or Floating state

Neither high state or ground state

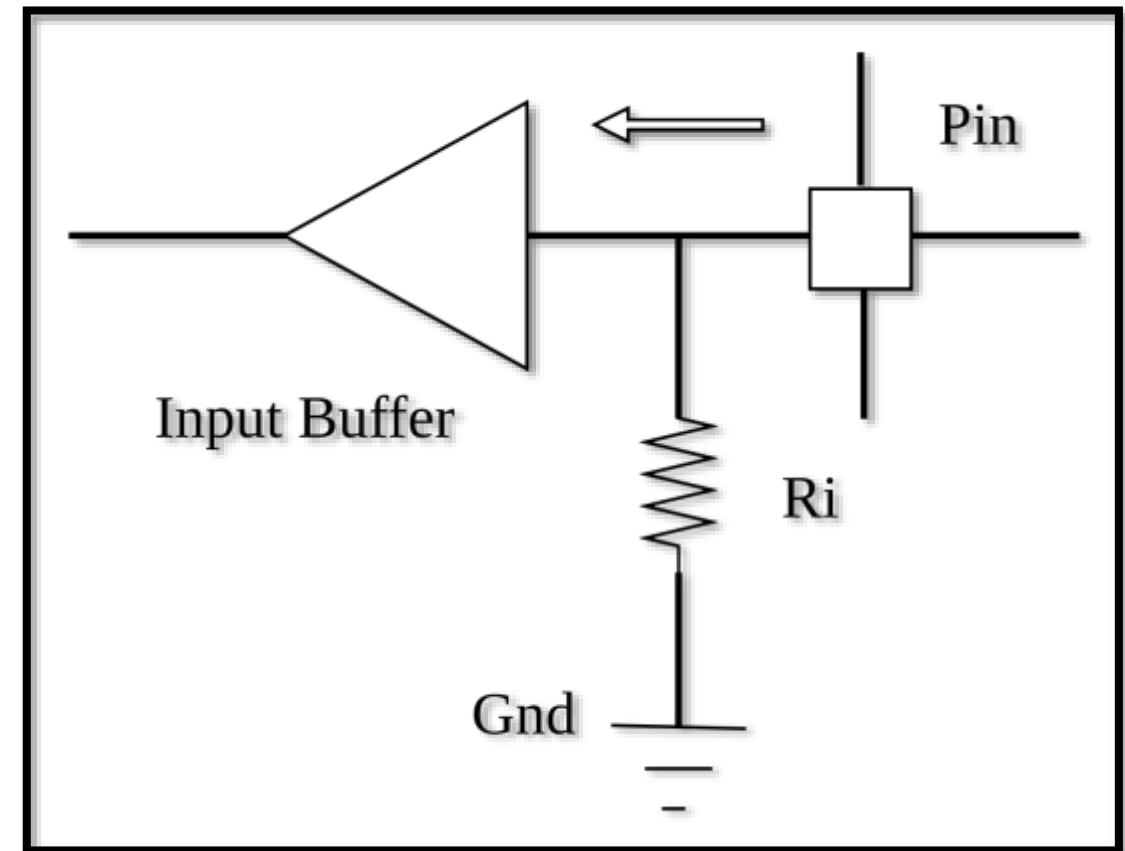
Keeping the pin in floating state lead to leakage current, more power consumption

GPIO input mode with pull-up /pull-down state

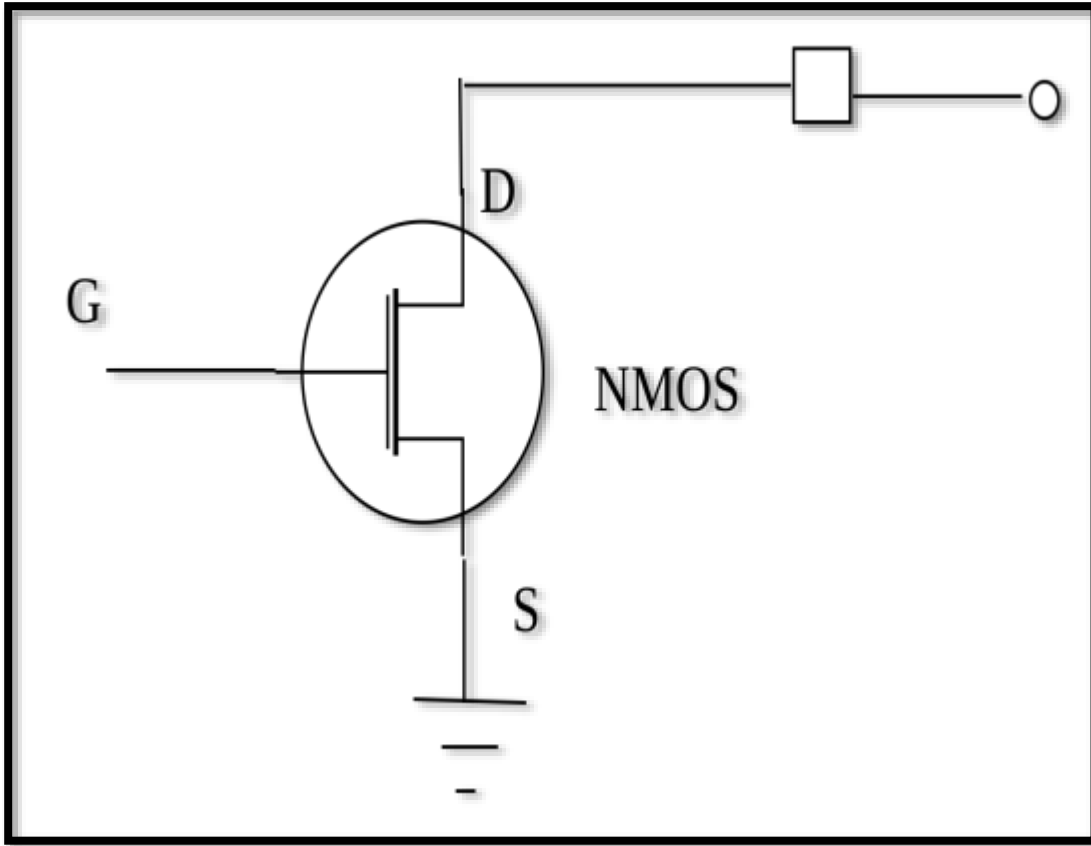


Internal Pull Up

Internal Pull Down



GPIO output mode with open drain state



Open-drain output configuration is nothing but the top PMOS transistor is deactivated



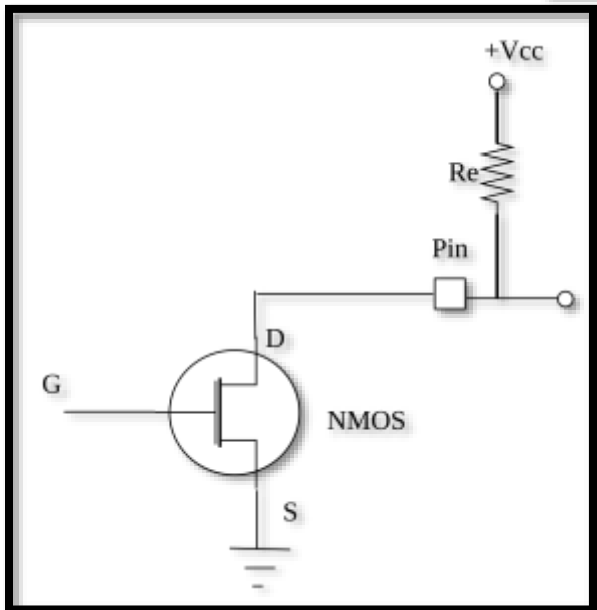
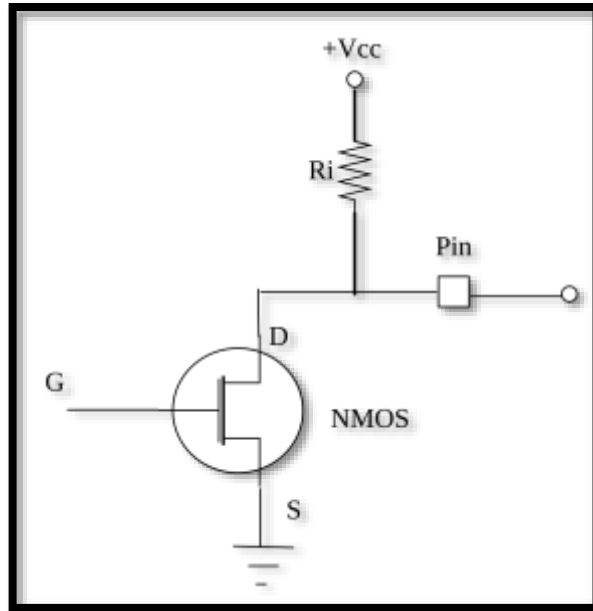
When the transistor is ON, the pin pulled to the ground.



When the transistor is OFF, the drain of the transistor will be floating or open.



That's the reason it is called an open drain.



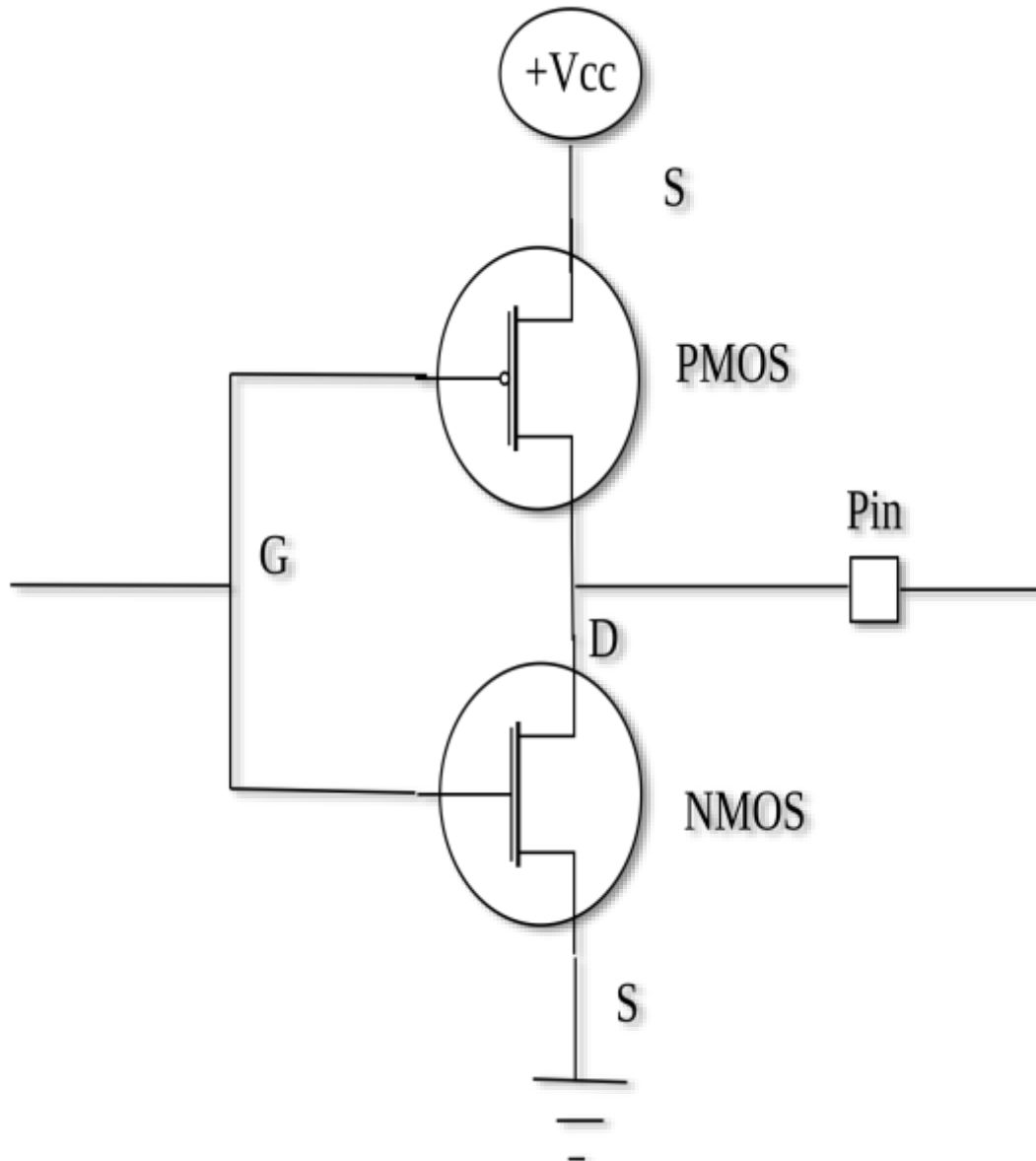
So, an open-drain configuration can only pull-down the pin, but it lacks pulling up capability.

Open-drain configuration has two states, either ground or floats.

Both are useless until you introducing pull-up resistor.

Activating internal pull-up or external pull-down resistor.

GPIO output mode with push pull state



The push-pull state is the default configuration of any GPIO pin in output mode.

When you enable GPIO port by default, its pin will be in input mode.

But if you set any pin as the output mode, then by default it will be in push-pull configuration.

The name Push-pull output configuration because output will be pulled actively between low and high by using two transistors.

Push-pull configuration doesn't need any pull-up/pull-down resistor.

Push-pull output uses two transistors. Each will be on to drive the output to the appropriate level.

Open Discussions



Developer
Wiki





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