

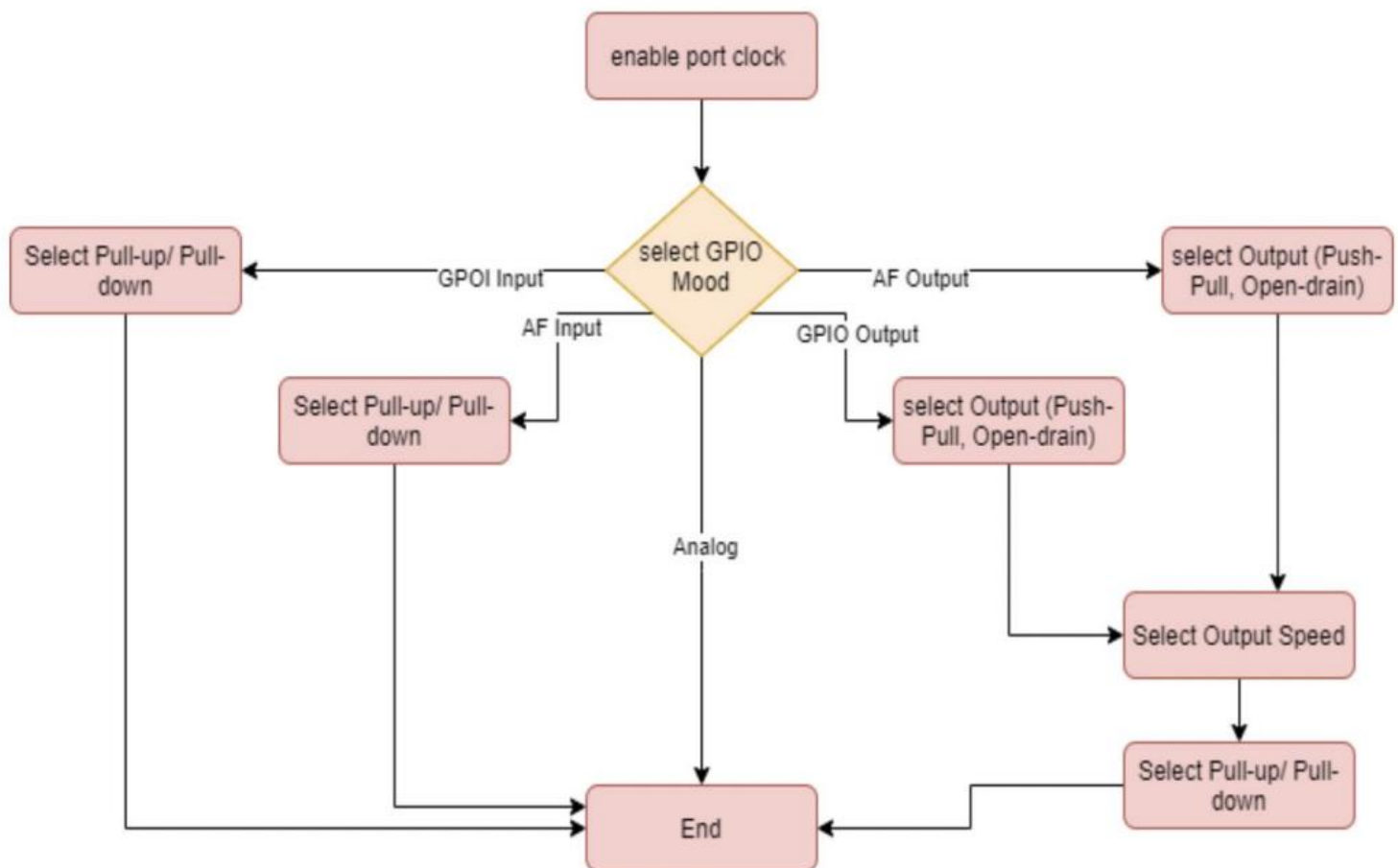
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Group : ITI . Embedded Adv. Al-Azhar G4 23

Task : 3

This chart is explain the modes of GPIO PINS



1- GPIO Input

When a GPIO pin is used as digital input, the pin has three states:

high voltage

Low voltage

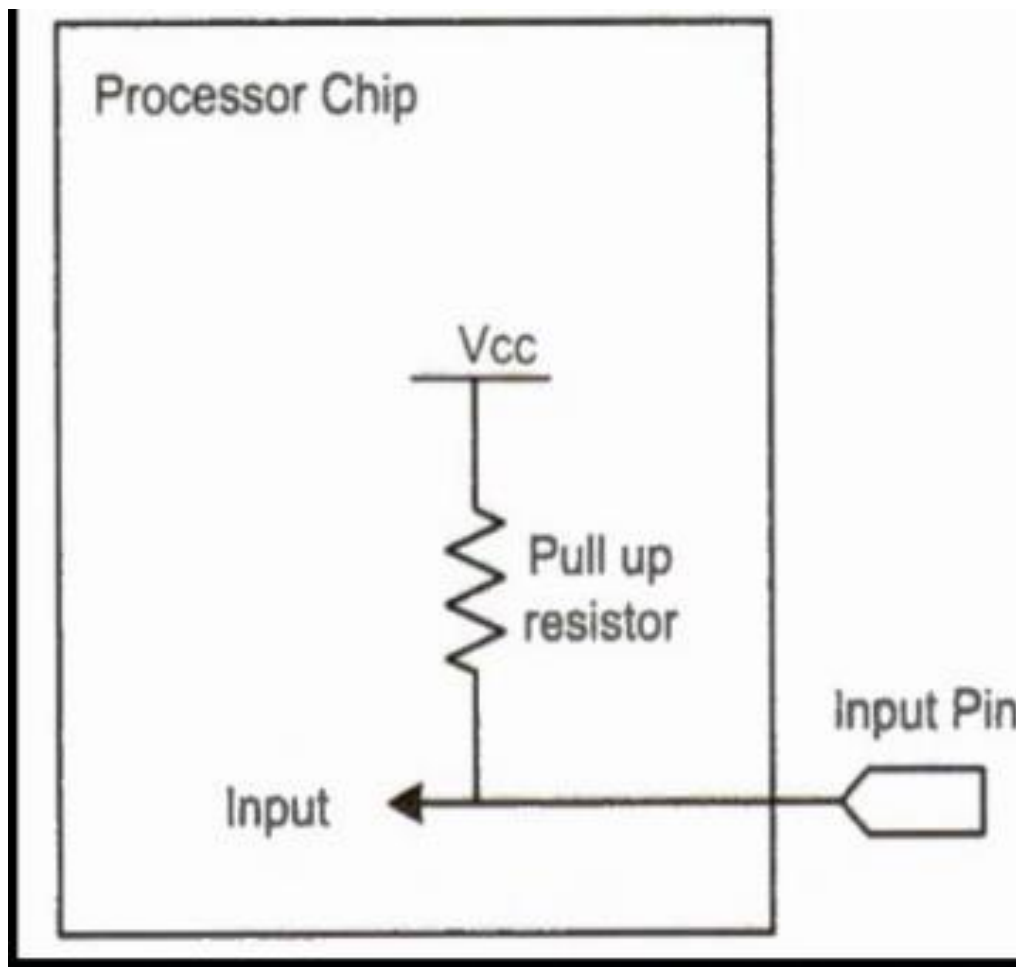
high impedance (also called floating or tri-stated)

Pull-up and pull-down are used to ensure the input pin has a valid high (logic 1) or a valid low (logic 0) when the

Pull Up

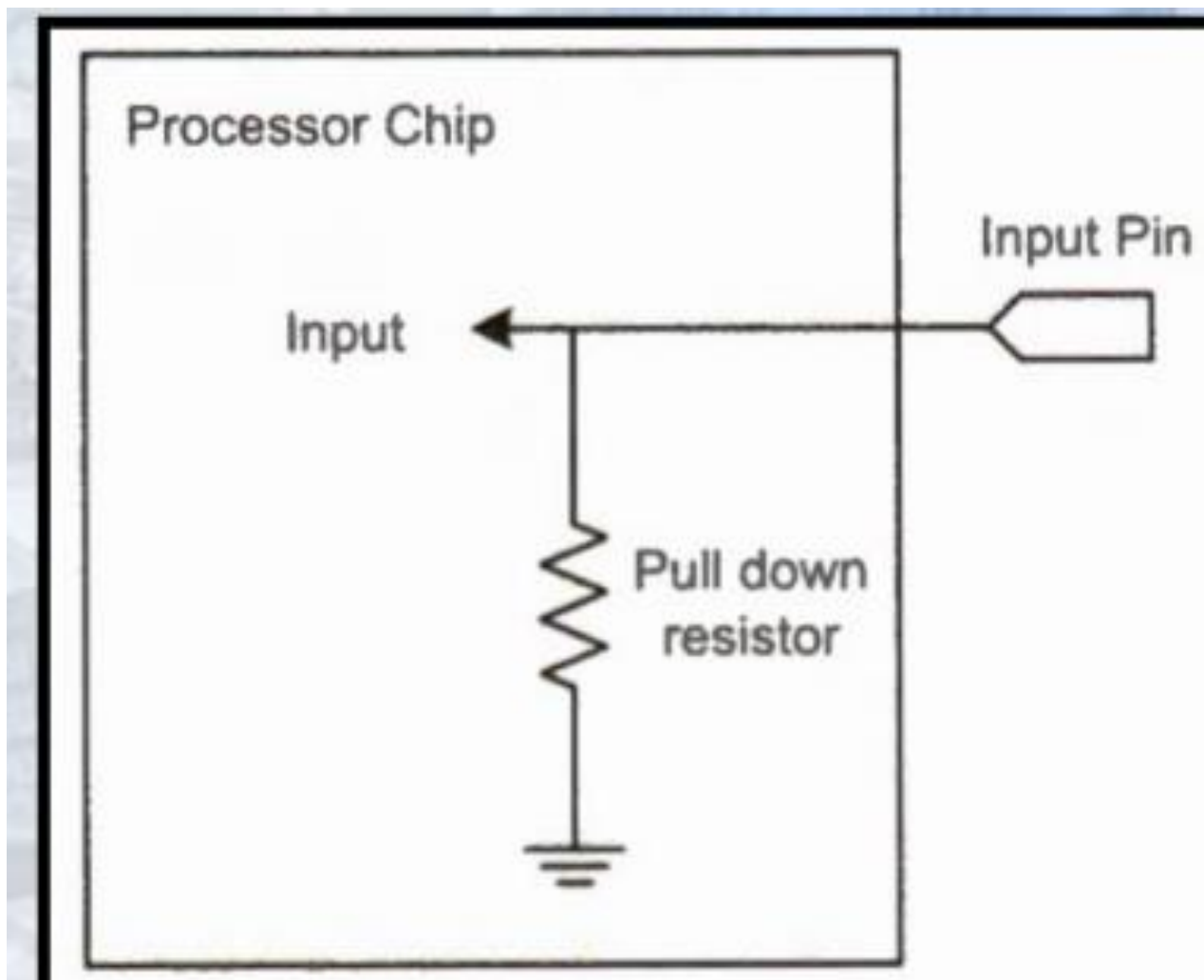
When software configures a pin as pull-up, the pin is internally connected to the power supply via a resistor

The pin is always read as high (logic 1) unless the external circuit drives this pin low



Pull Down

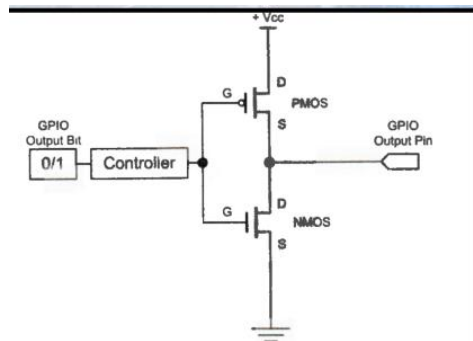
when a pin is configured as pull-down, the pin is then internally connected to the ground via a resistor. The pin is always read as low (logic 0) unless the external circuit drives this pin high.



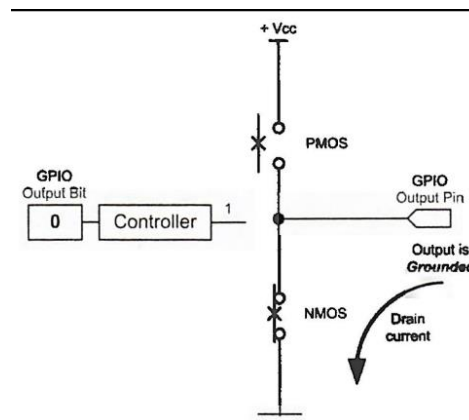
2-GPIO Output: in this mode we select Push-pull or open drain

Push-pull mode allows the pin to supply and absorb current.

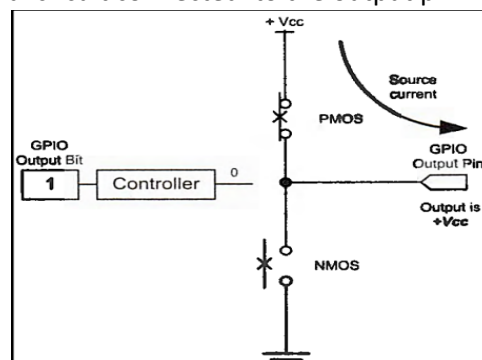
A push-pull output consists of a pair of complementary transistors



When logic 0 is outputted, the transistor connected to the ground is turned on to sink an electric current from the external circuit



When the pin outputs logic 1, the transistor connected to the power supply is turned on, and it provides an electric current to the external circuit connected to the output pin

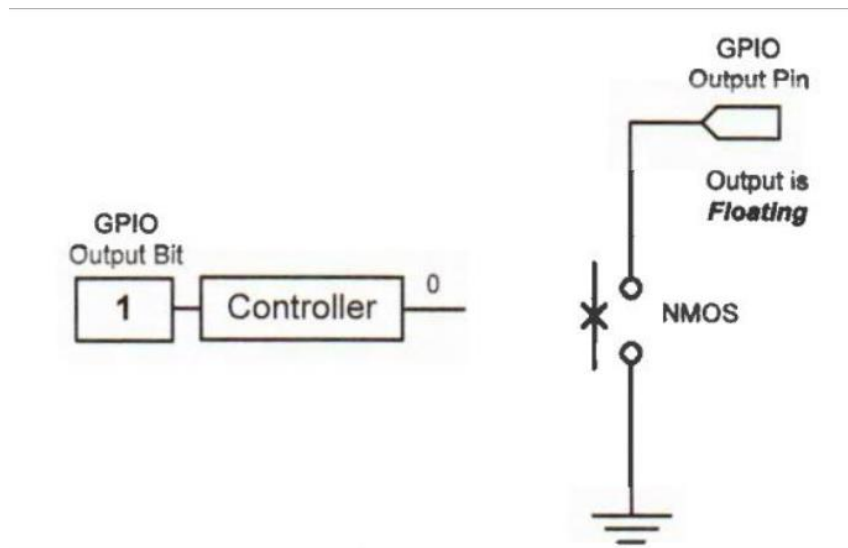


- GPIO pin in open-drain (also called collector) mode can only absorb current. An open-drain output consists of a pair of the same type of CMOS or transistors.

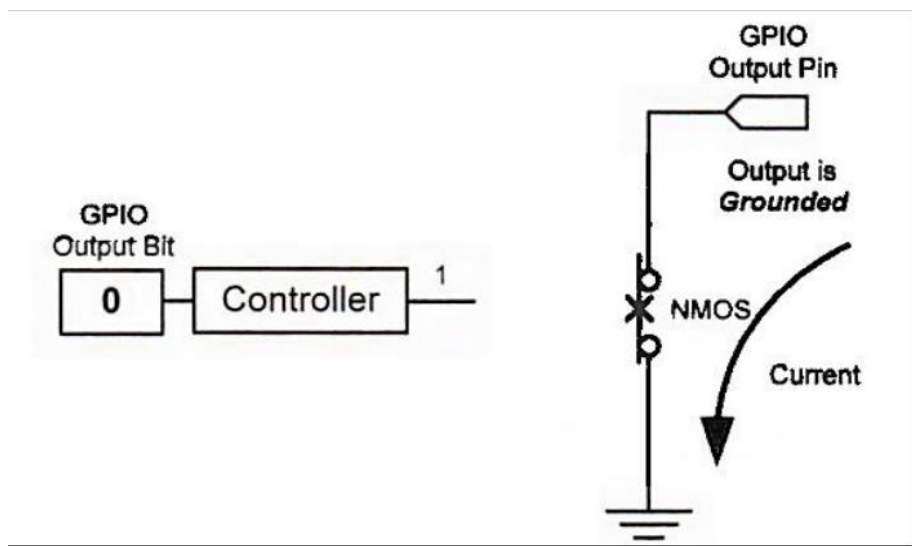
When software outputs a logic 0, the open-drain circuit can sink an electric current from the external load connected to the GPIO pin.

When software outputs a logic 1, it cannot supply any electric current to the external load because the output pin is floating, connected to neither the power supply nor the ground.

FLOATING



SINK Current



3-AFIO Mode

This mode provide to use to use the in different types such as

UART,SPI,TIMER.....etc

We enable this mode and select the the AFIO input or output

a-AFIO input

we select connection of PIN Pull up or Pull Down

(Pull up and down are explained above)

b-AFIO output

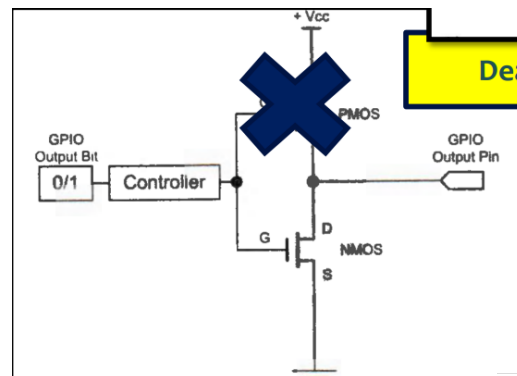
we select connection of PIN Push pull Open drain

- GPIO pin in open-drain (also called collector) mode can only absorb current An open-drain output consists of a pair of the same type of CMOS or transistors

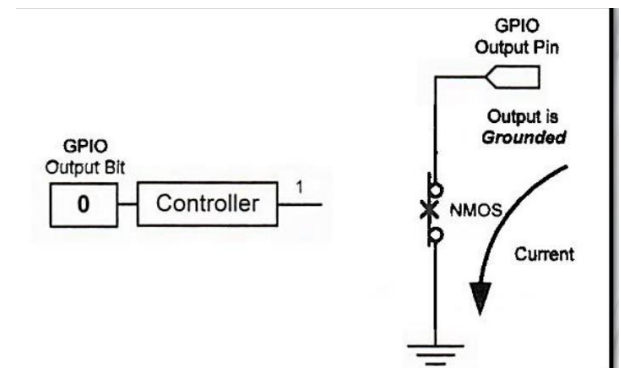
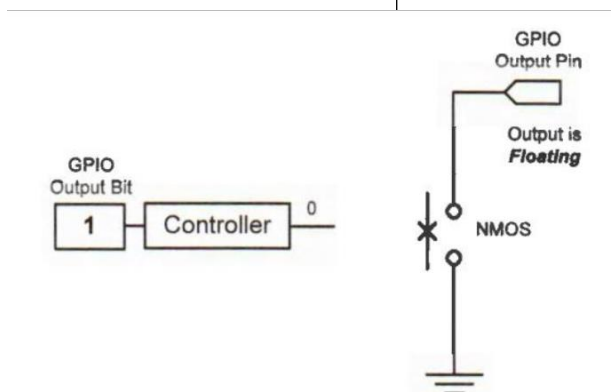
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when software outputs a logic 1, it cannot supply any electric current to the external load because the output pin is floating, connected to neither the power supply nor the ground.

floating

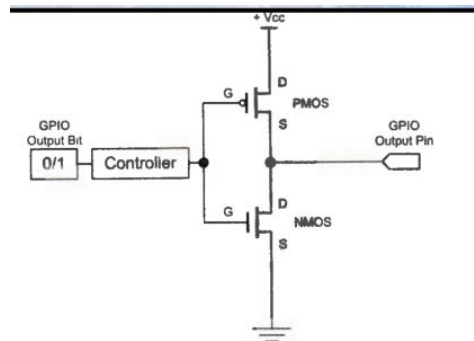


sink

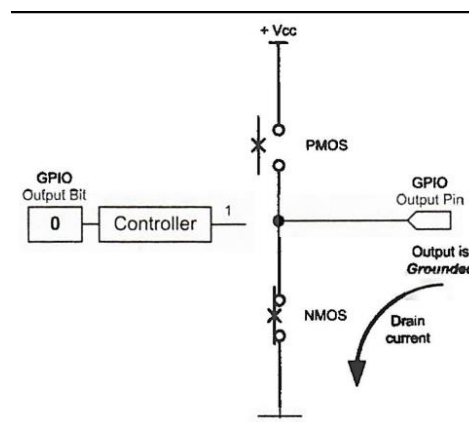


Push-pull mode allows the pin to supply and absorb current.

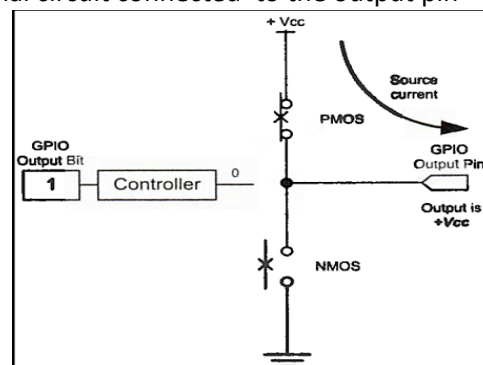
A push-pull output consists of a pair of complementary transistors



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4- Analog mode

"analog mode" typically refers to a specific configuration of a GPIO pin that allows it to function as an analog input or analog output.

Analog Input Mode: When a GPIO pin is configured as an analog input, it can measure and read continuous analog voltages. This mode is commonly used when interfacing with analog sensors, such as temperature sensors, light sensors, or potentiometers. The analog input pin usually converts the analog voltage into a corresponding digital value using an analog-to-digital converter (ADC). The digital value can then be processed by the microcontroller.

Analog Output Mode: Some microcontrollers also support analog output on certain GPIO pins. In analog output mode, the GPIO pin can generate a continuous analog voltage. This mode is useful when you need to control analog devices, such as actuators or motor speed controllers, that require a continuous voltage signal.