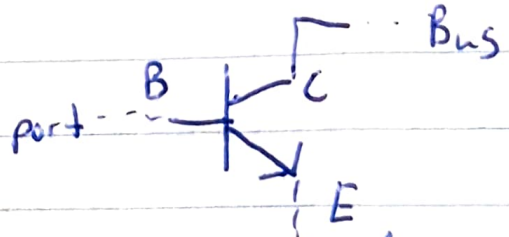
# 3. General Purpose Input/Output (GPIO)

- GPIO = Signal pin on integrated circuit (IC)
- programmable - I/O interface of MCU (Microcontroller unit)
- Tiva TM4C123x provides (43) GPIOs
- 40 on launchpad series (43) 43 lots of 10 single-line-headers (PA0 - PA7))
- 7 ports (PA - PG) (8 pins each e.g

- **LED's & Switches** (GPIO)
- 3 Led's (R, G, B)
- 2 buttons (SW1 & SW2)

| | |
|---|---|
| PF4 | SW1 |
| PF0 | SW2 |
| PF1 | Red |
| PF2 | ~~Blue~~ Blue |
| PF3 | Green |

- **Leds**




- When $V_{BE} > 0.7V$
  - transistor in saturated state (on state)
- If $V_{CE} < 0.2$
  - closed circuit (Led not on)
- Leds configured as **active high** → on when logic is 1 (true)
- logic of 1 enables.
- Active high = Logic is 1

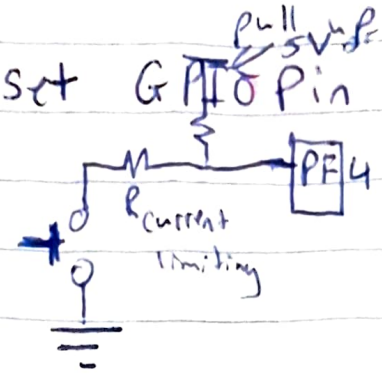
(resistor) • pull up = Active low
• pull down = Active High

connected to Vcc (switch SW connected to 0V

## • Input switches

pull up resistor = resistor is connected to Vcc
pull down resistor = resistor is connected to ground

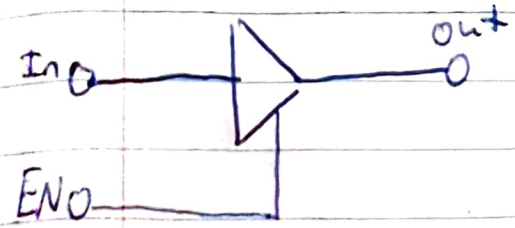
- set GPIO Pin as a (weak pull up)




(Active Low)
- Logic = 0 when button is pushed

## • GPIO Pin Multiplexing

- Highly flexible
- High impedance (open circuit)
(See 3. multiplexing)




(EN = Enable)

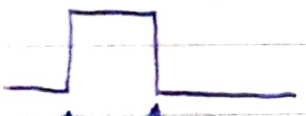
Truth table

| EN | IN | Out |
|---|---|---|
| 0 | X | Hi-Z (open circuit) |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

• when enable pin (EN) is off the IN doesn't matter

## • Programmable Control for GPIO Pins

- Pad configuration for Port Pins (e.g. Pin X)
- w PU vs WPD
- Input vs output
- 2, 4, 8 pad drive (mA)



- **GPIO Pins usage**

(initializing)

1. system requires peripherals GPIO
   - SysCtlPeripheralEnable(SYS_PER_PORTx)

(Configuration)

Set as a WPU or WPD

2. GPIOPadConfigSet(...) (set pins) Set(PinX)
   (weak ↑)

3. GPIODirModeSet(...) Set(DDrx)

4. Access

GPIOPinRead = read pinx

GPIOPinWrite = Write to pin (Portx)