

Lecture (01)

Applied Electric/Electronic Circuits I

Dr. Ahmed M. ElShafee

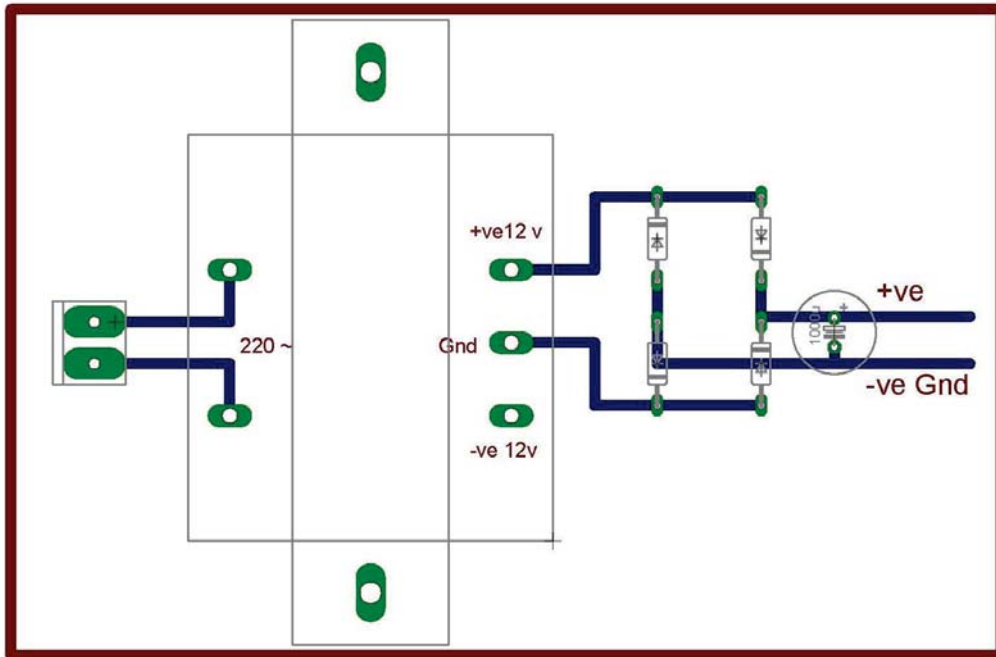
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Agenda

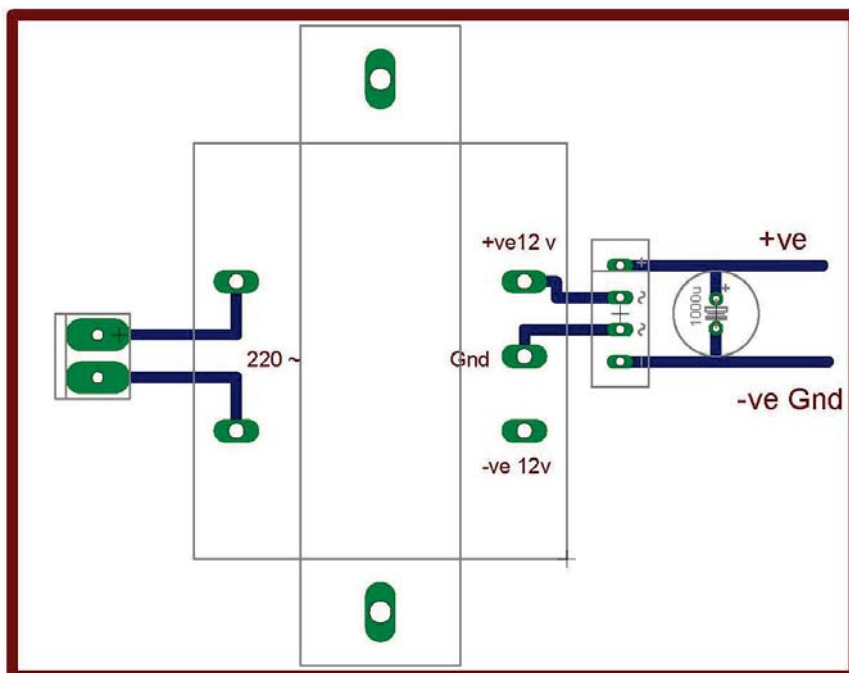
- Build 220V AC/ 12V DC power converter
- Build 5V voltage regulator
- Connecting led
- Connecting 16F84A (Led Flasher)
- Connecting Press
- Connecting 16F84A (press controlled Led Flasher)

Build 220V AC/ 12V DC power converter

1. Using diodes

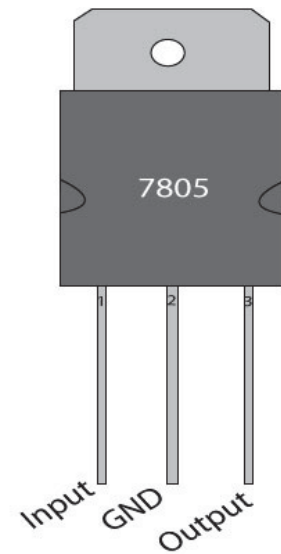


2. Using bridge rectifier



Build 5V voltage regulator

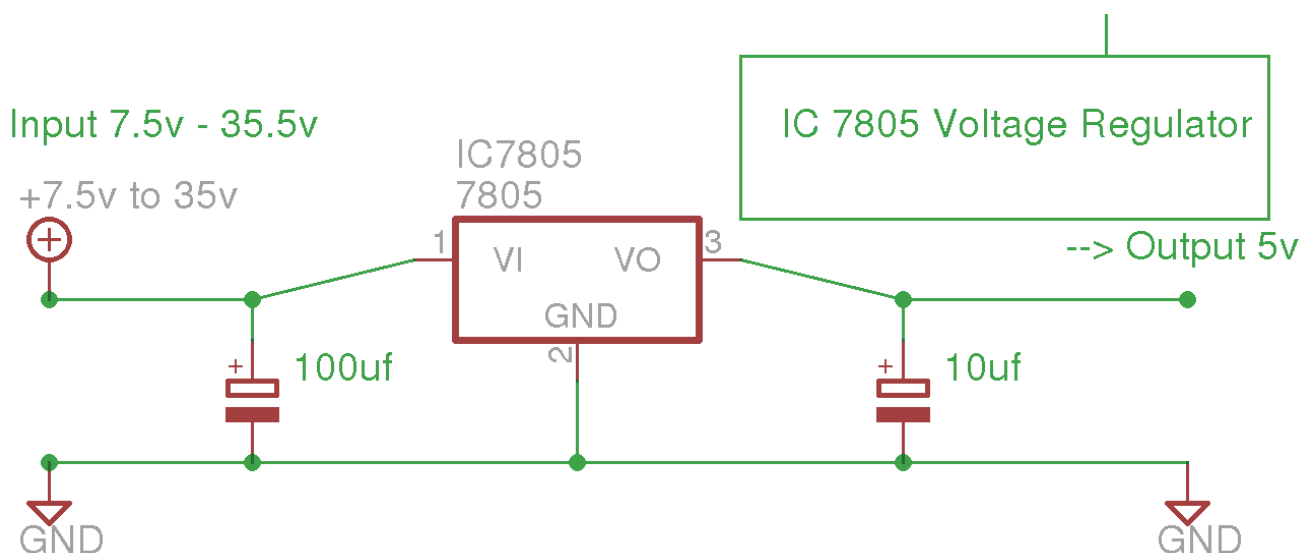
- **7805** is a **voltage regulator** integrated circuit, which is a member of 78xx series of fixed linear voltage regulator ICs.
- The voltage source in a circuit may have fluctuations and would not give the fixed voltage output.
- The **voltage regulator IC** maintains the output voltage at a constant value.
- The xx in 78xx indicates the fixed output voltage it is designed to provide.
- 7805 provides +5V regulated power supply.

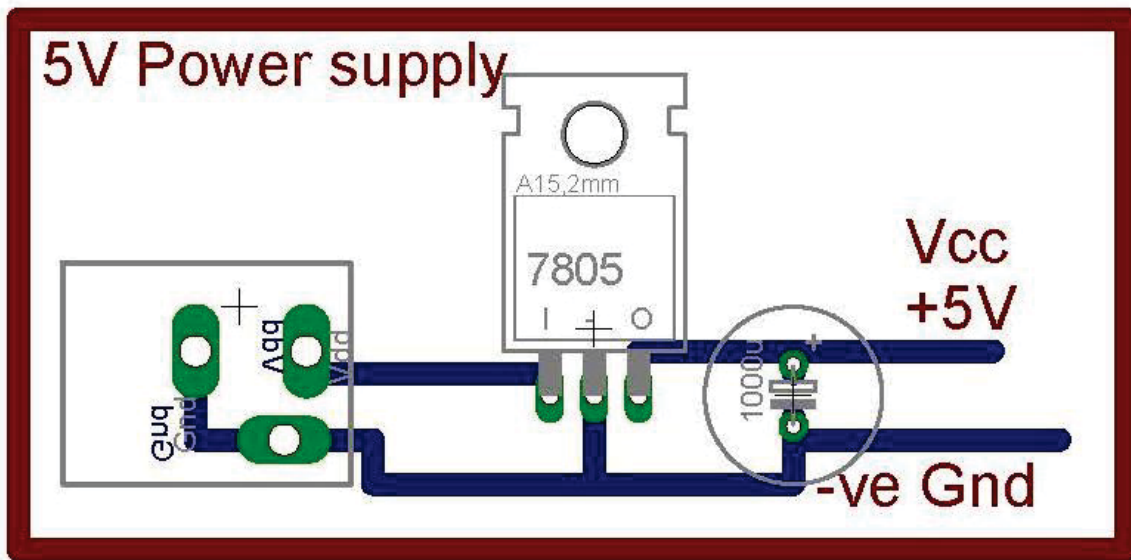


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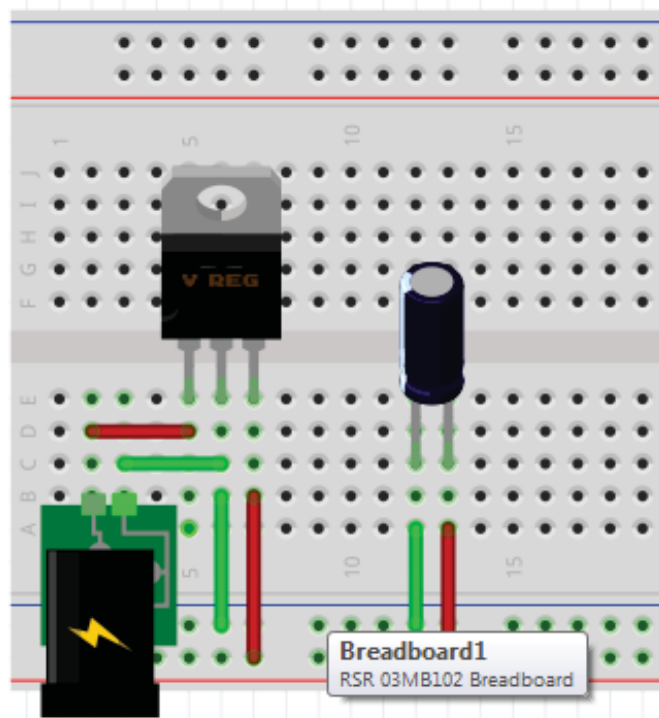
- Capacitors of suitable values can be connected at input and output pins depending upon the respective voltage levels.





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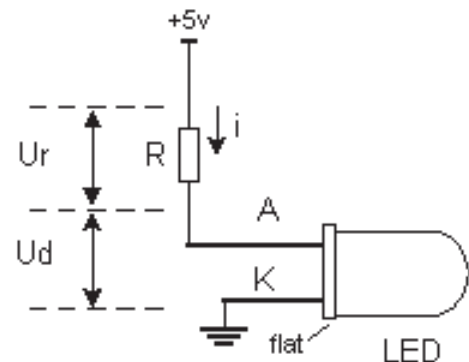
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Connecting led

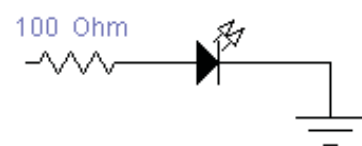
- Two types based on its diameter, which is usually 3 or 5 mm
- working current which is usually about 10mA
- current-limiting resistor must be the correct value so that the LED is not damaged or burn out (overheated).
- The voltage drop will range from 1.2v to 1.6v depending on the color of the LED.



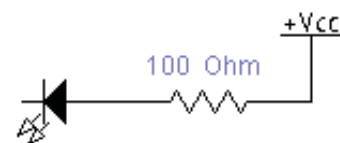
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- LEDs are connected to a microcontroller in two ways.
- One is to switch them on with logic zero, and other to switch them on with logic one.
- The first is called NEGATIVE logic and the other is called POSITIVE logic.
- The optimum value for limiting resistor is 330 Ω , 220 Ω or 100 Ω



Active high led indicator



Active Low led indicator

10

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- Calculating limiting resistor value
- optimum LED forward voltage is 1.6V (data sheet)

$$V_f = 1.6V$$

- The total voltage applied to both LED and limiting resistor is 5V

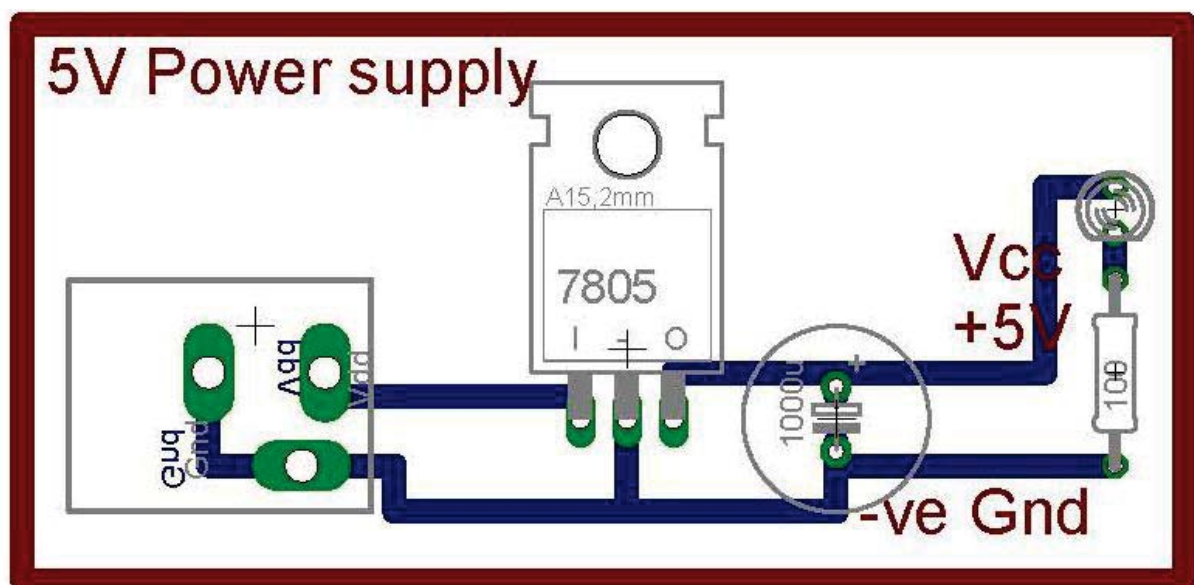
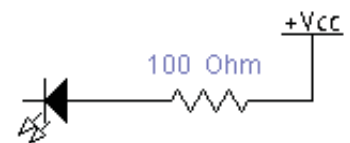
- Then the voltage drop over limiting resistor is

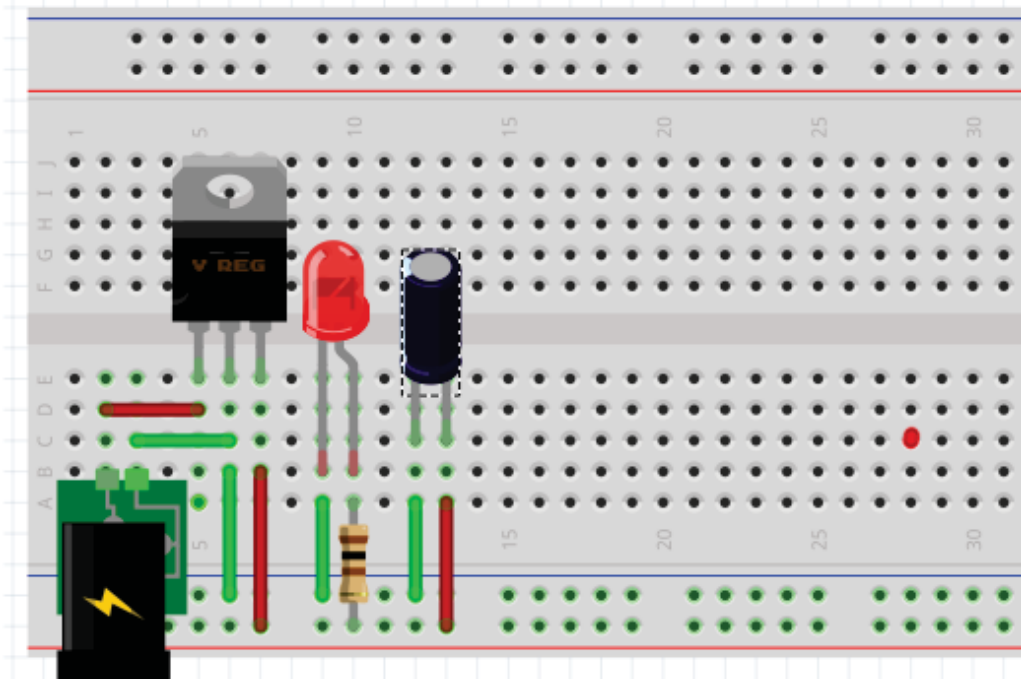
$$V_r = V_{cc} - V_f = 5 - 1.6 = 3.4 \text{ volt}$$

- Optimal led current is 25mA (data sheet)

$$I = 25 \text{ mA}$$

$$R = V_r / I = 3.4 / (25 * 10^{-3}) = 136 \text{ ohm}$$

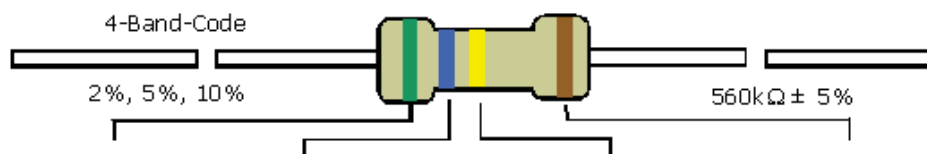




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Resistor color code



COLOR	1st BAND	2nd BAND	3rd BAND	MULTIPLIER	TOLERANCE
Black	0	0	0	1Ω	
Brown	1	1	1	10Ω	± 1% (F)
Red	2	2	2	100Ω	± 2% (G)
Orange	3	3	3	1KΩ	
Yellow	4	4	4	10KΩ	
Green	5	5	5	100KΩ	±0.5% (D)
Blue	6	6	6	1MΩ	±0.25% (C)
Violet	7	7	7	10MΩ	±0.10% (B)
Grey	8	8	8		±0.05%
White	9	9	9		
Gold				0.1	± 5% (J)
Silver				0.01	± 10% (K)

- 100 Ω



- 220 Ω



- 330 Ω



- 1 K Ω



- 10 k Ω



- 100 k Ω



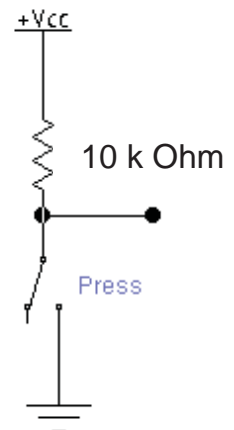
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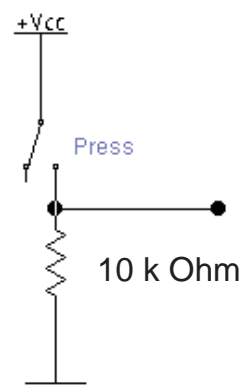
Connecting Press

- Buttons that are used here are also called "press-buttons".
- A pull-up resistor is needed to avoid producing short circuit between Vcc, and Gnd
- There are two possible connections as shown
 - Active high
 - Active low
- The average current consumed by resistor

$$I_r = V_{cc} / R = 5 / (10 \cdot 1000) = 0.5 \text{ mA}$$



Active high input press

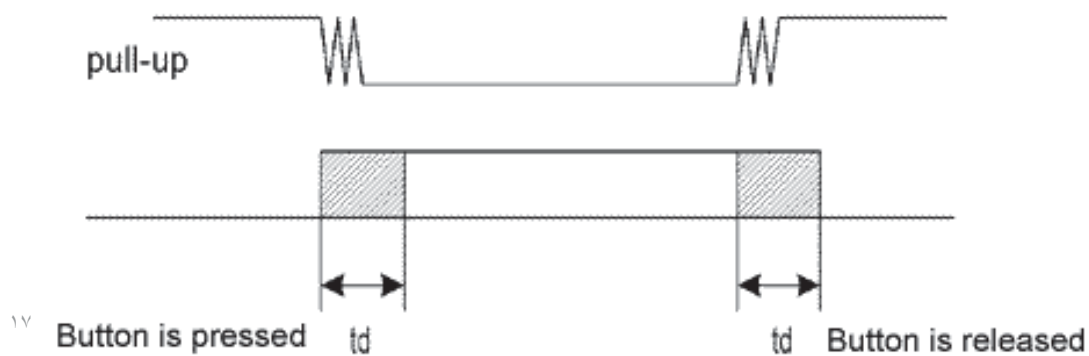


Active Low input press

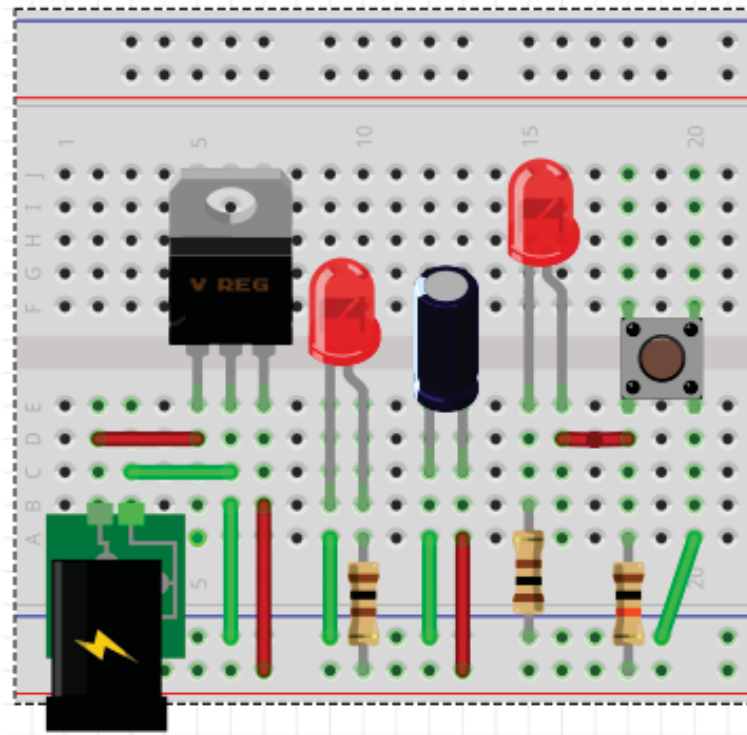
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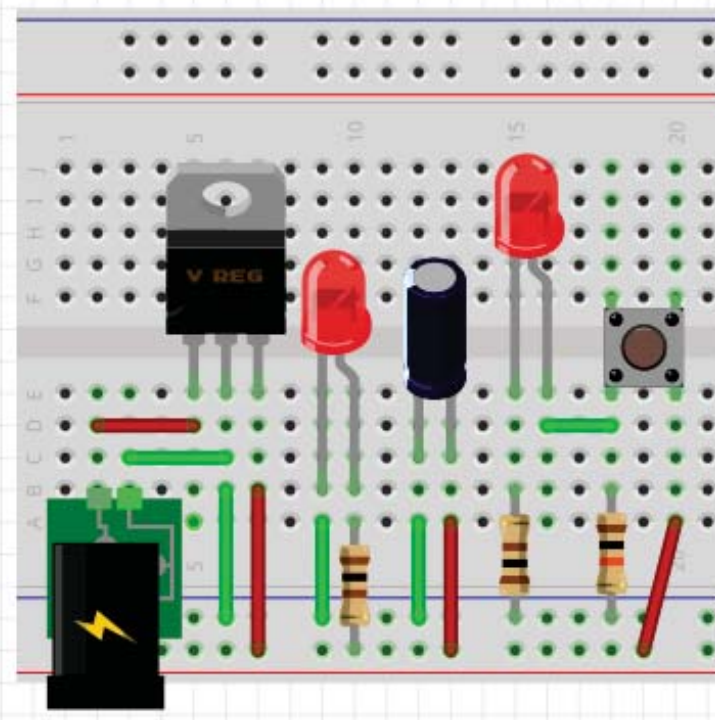
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- there is a short time period when vibration (oscillation) can occur as a result of unevenness of mechanical contacts, or as a result of the different speed in pushing a button (this depends on person who pushes the button).
 - this phenomena is called SWITCH (CONTACT) DEBOUNCE.



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- If this is overlooked when program is written, an error can occur, or the program can produce more than one output pulse for a single button push.
 - to avoid this, we can introduce a small delay when we detect the closing of a contact.
 - This will ensure that the push of a button is interpreted as a single pulse.

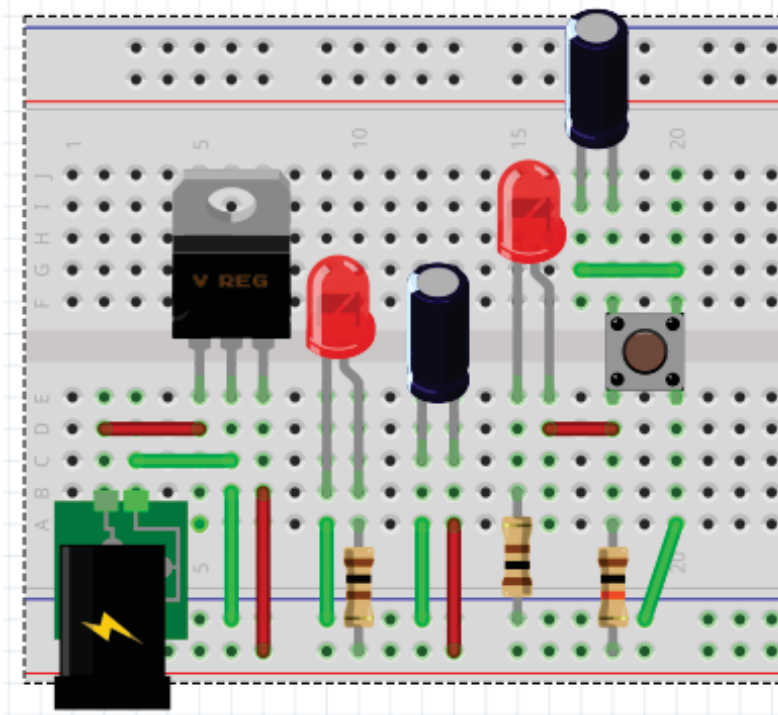
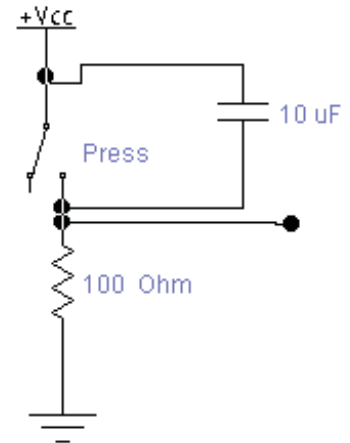
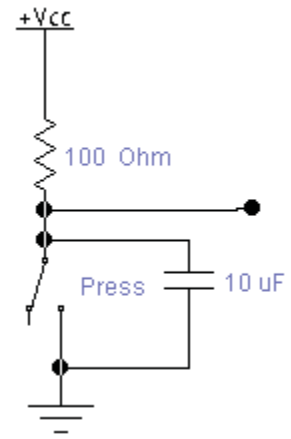


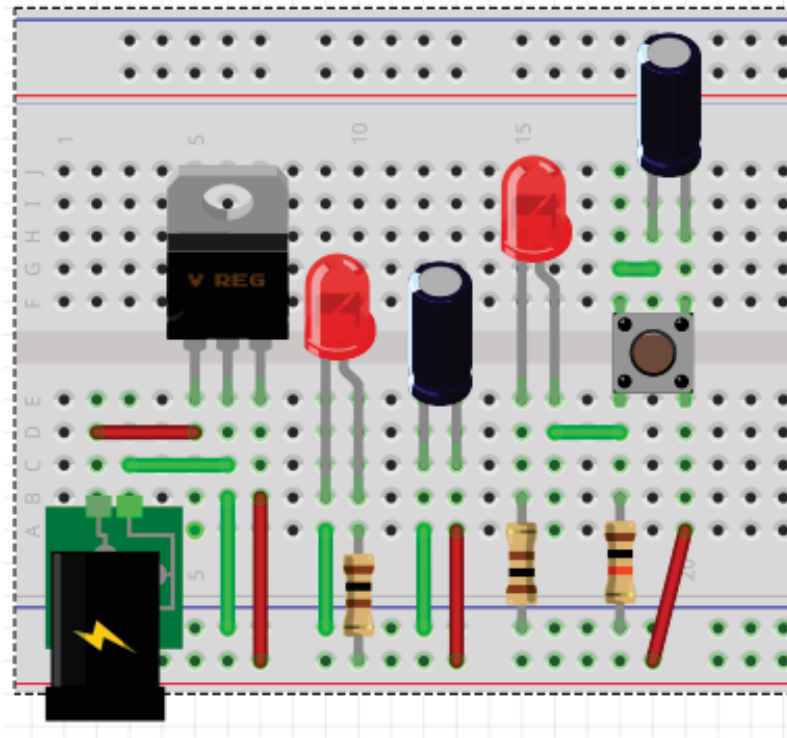
Applications CS II



Applications CS II

- The problem can be partially solved by adding a capacitor across the button, but a well-designed program is a much-better answer.
- The program can be adjusted until false detection is completely eliminated.





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Thanks,..
See you next week (ISA),...