Lab-15

One-Shot (Monostable)

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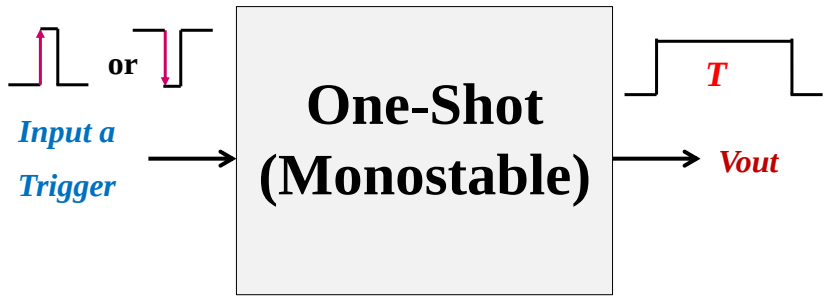
Objectives

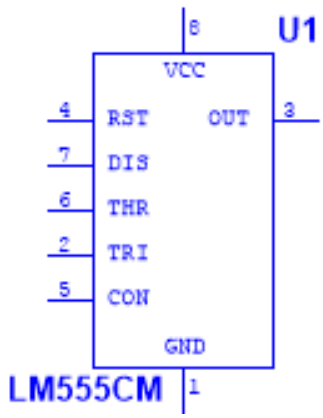
- Understand the fundamental of one shot or monostable multivibrator.
- Understand the fundamental of a one shot based on timer 555.
- Applications based on 555 one-shot in series.
- Understand the fundamental of a one shot based on TTL 74121.
- Applications based on 74121 one-shot in series.

What is One-Shot

- ***Vout*** **output a voltage for a time** ***T*****, if a signal is triggered once to the input.**

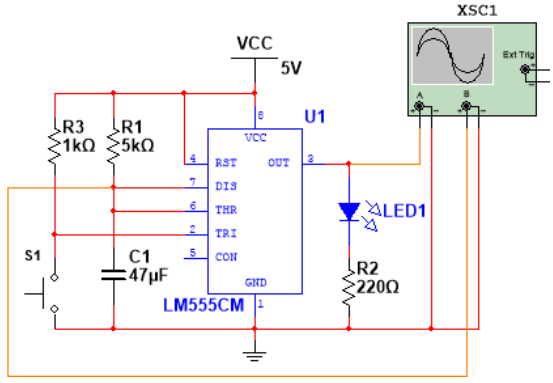


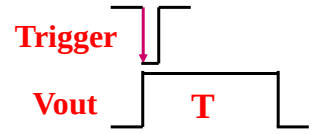
555 Timer



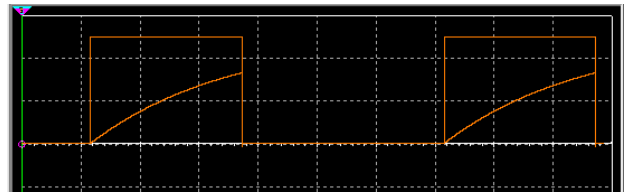
Vcc(8): 5V~15V
GND(1): 0V
OUT(3): 0V or VCC
RST(Reset)(4): if RST=0V,OUT=0V
RST=Vcc if normal state
THR(Threshold)(6): if THR≧2/3 Vcc, then OUT=0V by via DIS (discharge)(7)
TRI(Trigger)(2): if TRI≦1/3 Vcc, then OUT=Vcc
Con(Control voltage)(5): Connect 0.1μF to GND

One-Shot based on 555

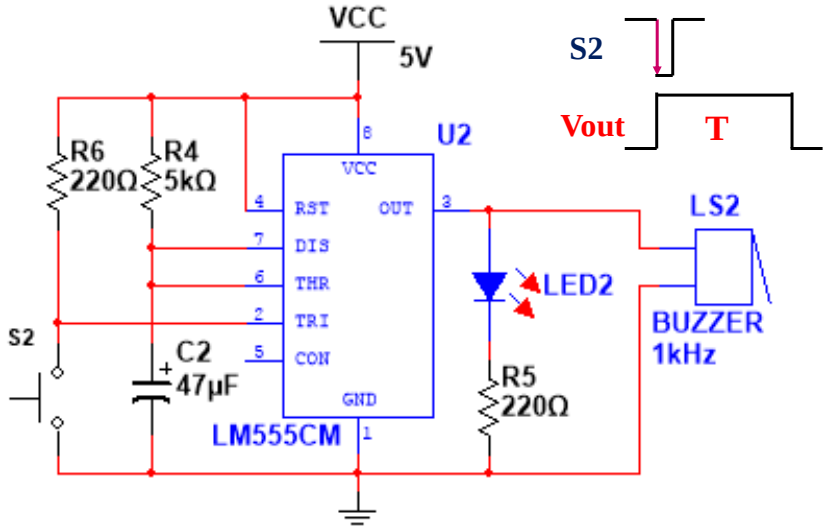




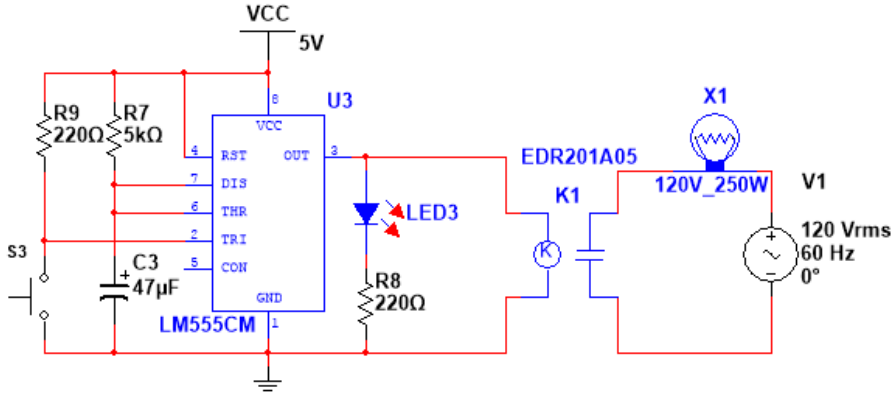
Vout: 0V-5V-0V Pulse
Vc1: 0V→ 2/3*5V→0V exponential wave
T = 1.1*R1*C1
= 1.1*5k*47µ
= 258.5ms



555 One-Shot Applications

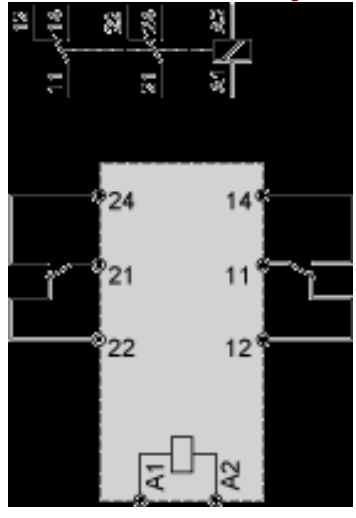


One-Shot to Turn on a Lamp

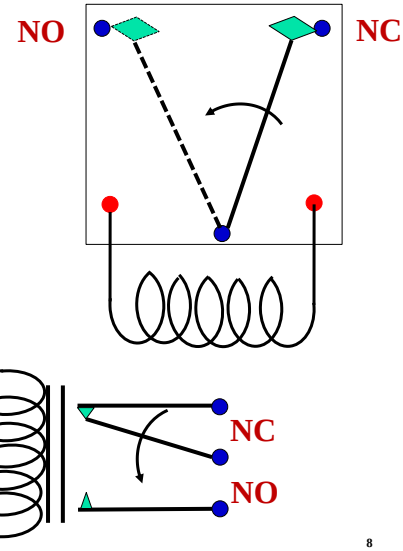


Relay

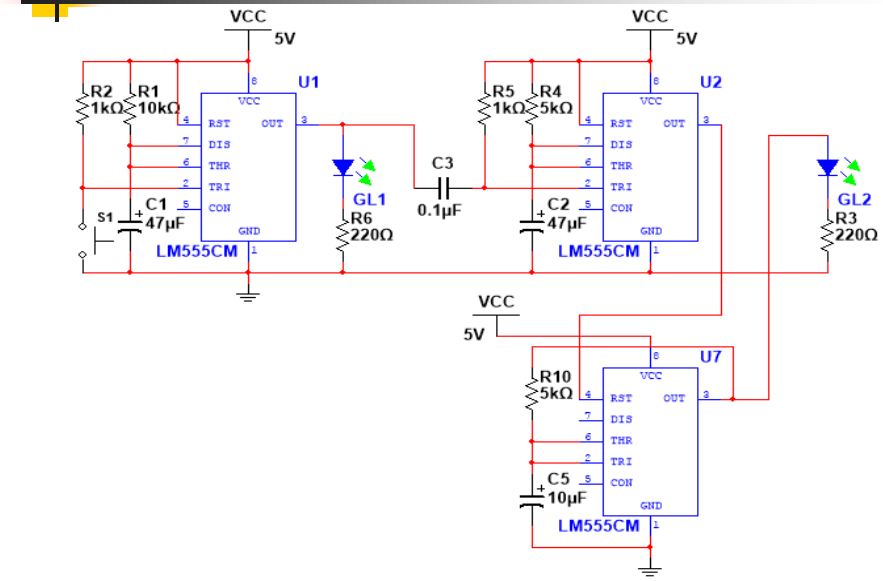
DC-6V Relay



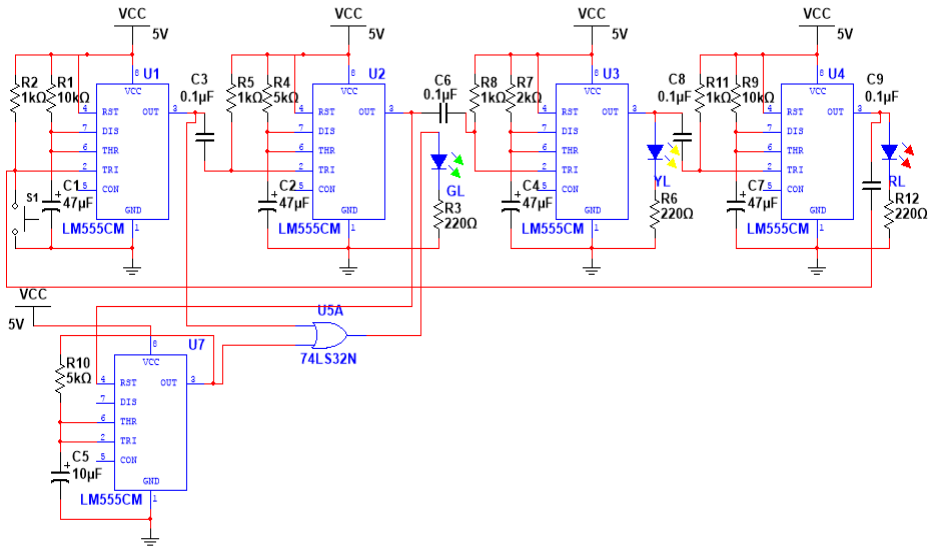
DC-5V Relay



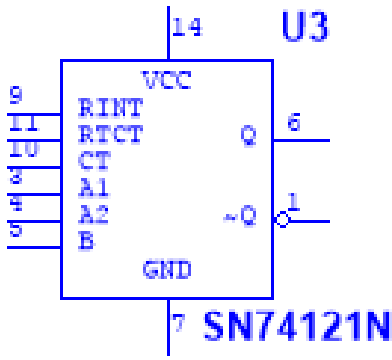
555 One-Shot in Series



Traffic Signal based on 555 One-Shot

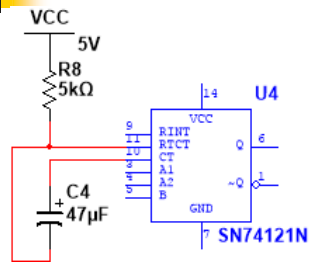


One-Shot based on 74121

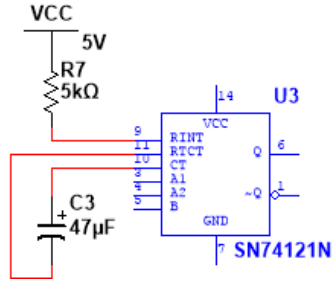


/A1	/A2	B	Q
1→0	0	x	0
1→0	x	0	0
1→0	1	1	pulse
0	1→0	x	0
x	1→0	0	0
1	1→0	1	pulse
1	1	0→1	0
0	x	0→1	pulse
X	0	0→1	pulse

Two RC Choices for 74121

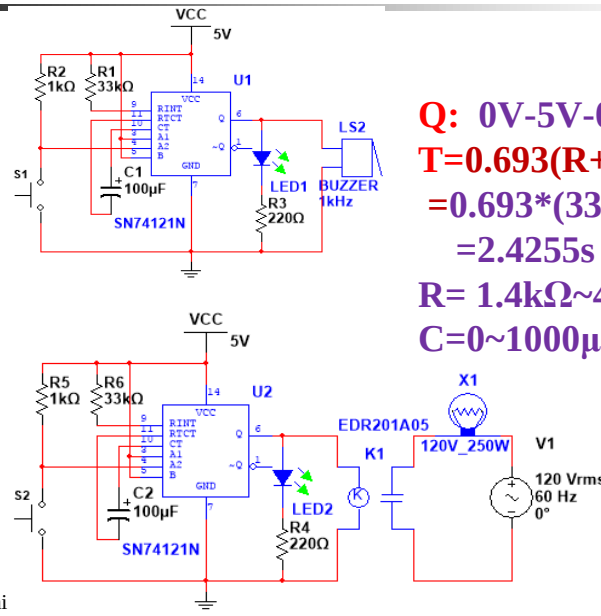


Q: 0V-5V-0V Pulse
T=0.693RC=0.693*5k*47μ
=162.855ms
R= 1.4kΩ~40kΩ
C=0~1000μF



Q: 0V-5V-0V Pulse
T=0.693(R+2kΩ)C
=0.693*(5k+2k)*47μ
=227.997ms
R= 1.4kΩ~40kΩ
C=0~1000μF

74121 One-Shot Applications



Q: 0V-5V-0V Pulse

T=0.693(R+2kΩ)C

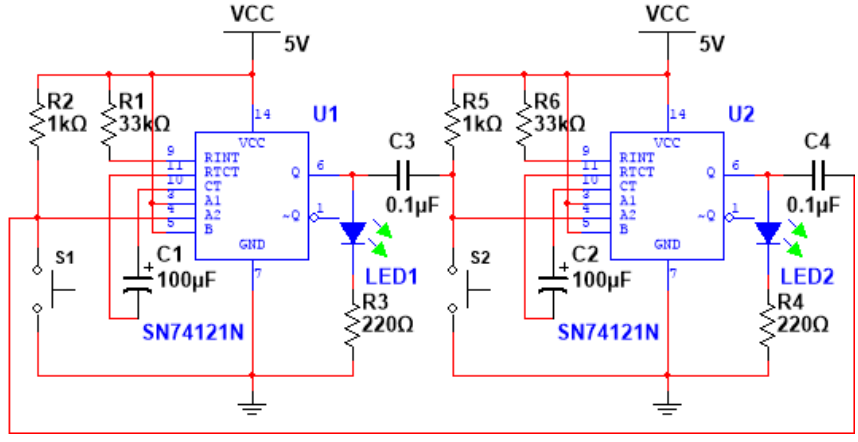
=0.693*(33k+2k)*100μ

=2.4255s

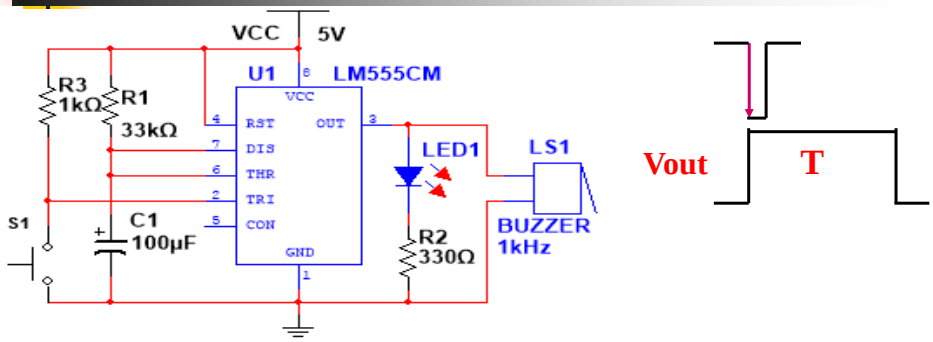
R= 1.4kΩ~40kΩ

C=0~1000μF

74121 One-Shot in Series



Experiment-1 One-Shot based on 555



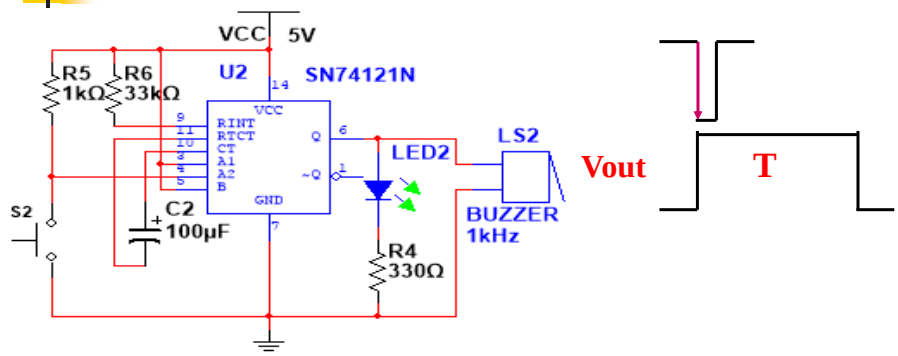
Vout: 0V-5V-0V Pulse

Vc1: 0V→ 2/3 * 5V→0V exponential waveform

T = 1.1*R1*C1

= 1.1*33k*100μ = 3.53 s

Experiment-2 One-Shot based on 74121

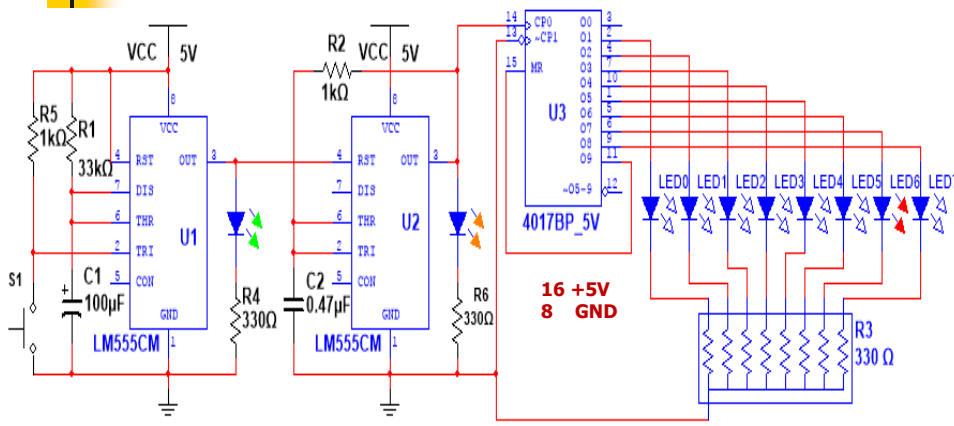


Q: 0V-5V-0V Pulse

T = 0.693(R+2kΩ)C = 0.693*(33k+2k)*100μ

= 2.4255 s

Experiment-3
One-Shot Application: Roulette Game



Push S1 once ➔ One Shot
OUT: 0V-5V-0V Pulse
T = 1.1*R1*C1
= 1.1*33k*100μ = 3.53 s

If RST=+5v ➔ Astable OSC
OUT: 0-5V Square wave
T = 1.4*R1*C1
= 1.4*1k*0.47μ = 0.658ms
f = 1/T = 1/0.658 = 1.5Hz

If Astable OSC is work ➔
Only one LED on one time from left to right