# Subsystems – Research – Specify – Build – Test – Evaluate

## 555 Monostable

**Research**

I used the [www.ti.com/lit/ds/symlink/lm555.pdf](http://www.ti.com/lit/ds/symlink/lm555.pdf) data sheet to find out …

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| 1. The chip pinout
2. The maximum safe power supply voltage
3. The maximum safe chip current
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| **Specification and Test Planning**1. Run on 4.5 to 16 Volts (The available power supply gives 12 to 15 Volts)**TEST:** Use a multimeter to test the circuit on 12, 13, 14 and 15 Volts.Check the timing at each of these voltages.
2. Be triggered by a low pulse less than 1/3rd of the power supply.**TEST:** Use a picoscope to measure the trigger pulse.
3. Produce a pulse 1 to 1.2 seconds long.**TEST:** Use a picoscope to measure this period.
4. The chip current will be limited to less than 200 mA**TEST:** Use a multimeter to measure the current.
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**Circuit Diagram and Calculations**

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|  | **T = 1.1 RC****Use 10 microfarads for the timing capacitor****Calculate for a 1.1 second pulse****R = 1.1 / ( 1.1 x 10 / 1000000) Ohms****R = 100 kΩ** |
| **The Finished Subsystem** | **HOW IT WORKS**1. R2 is a pull up resistor. The trigger switch pulls the trigger voltage down to 0 V
2. The timer starts when the trigger voltage drops below 1/3rd of the power supply.
3. The output goes high and the discharge transistor turns off.
4. C1 charges through R1 until the Threshold voltage reaches 2/3rd of the power supply voltage. This takes 1.1 R C Seconds.
5. The output goes low and C1 is quickly discharged.
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**Testing**

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| **Test** | **Set PowerSupply** | **Input Pulse Length** | **Output Pulse Length1.1 s expected** | **Output Pulse Voltage** | **Subsystem Current** |
| 1 | 12 Volts | 0.1 s | 1.09 s | 12 V | 20 mA |
| 2 | 13 Volts | 0.1 s | 1.1 s | 13 V | 21 mA |
| 3 | 14 Volts | 0.1 s | 1.1 s | 14 V | 22 mA |
| 4 | 15 Volts | 0.1 s | 1.12 s | 16 V | 24 mA |

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| Test 1) Blue Input – Red OutputInput pulse length is about 0.1 seconds.Output pulse length is 1.09 seconds.Output pulse voltage is just under 12 V. | Test 2) Blue Input – Red OutputInput pulse length is about 0.1 seconds.Output pulse length is 1.1 seconds.Output pulse voltage is 13 V. |
| Test 3) Blue Input – Red OutputInput pulse length is about 0.1 seconds.Output pulse length is 1.1 seconds.Output pulse voltage is close to 14 V. | Test 4) Blue Input – Red OutputInput pulse length is about 0.1 seconds.Output pulse length is 1.12 seconds.Output pulse voltage is close to 16 V. |

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| **Evaluation of the Specification**1. Run on 4.5 to 16 Volts (The available power supply gives 12 to 15 Volts)Check the timing at each of these voltages.**SUCCESS:** The timing was correct at each voltage to within +/- 2%.
2. Be triggered by a low pulse less than 1/3rd of the power supply.**SUCCESS:** The low trigger pulses did trigger the timer.
3. Produce a pulse 1 to 1.2 seconds long.**SUCCESS:** The pulse lengths were 1.1 +/- 2% Seconds.
4. The chip current will be limited to less than 200 mA**SUCCESS:** The chip current was between 20 and 24 mA. This was much less than the 200 mA limit.

**Conclusion**The timer pulse length was correct within 2%.The supply voltage had little effect on the pulse length.Trigger pulses were about 0.1 seconds long and worked well.The output voltage was similar to the supply voltage.This is a 100% correct working circuit and it is fit for its purpose. |