555 Timer Astable Frequency, Duty Cycle and Monostable Pulse

Frequency, period, high and low times and duty cycle of a 555 timer in astable mode, and the pulse width in monostable mode, from the timing resistors and capacitor.

Method: Charging between one and two thirds of the supply (555 timer)

Input parameters

Unit system: SI

Parameter	Value	Unit
Resistor R_A (VCC to discharge)	4.7000	kΩ
Resistor R_B (discharge to threshold)	47.000	kΩ
Timing capacitor	0.010000	µF

Calculated results

Parameter	Value	Unit
Astable frequency	1,461.7	Hz
Output high time 0.693(R_A + R_B)C	0.35836	ms
Output low time 0.693 R_B C	0.32578	ms
Duty cycle t_H/T	52.381	%
Monostable pulse width 1.1 R_A C	0.051635	ms

Notes for this case

• The capacitor charges between ⅓ and ⅔ of the supply: t = RC ln 2 for each half-cycle (0.693RC) and ln 3 (1.1RC) for the monostable. The duty cycle exceeds 50 % unless R_B is bypassed by a diode.

Formula and method

$$t_H = 0.693(R_A + R_B)C, \quad t_L = 0.693 R_B C, \quad f = \frac{1.44}{(R_A + 2R_B)C}, \quad t_{mono} = 1.1 R_A C$$

Variables

R_A	Resistor R_A (VCC to discharge)	Ω
R_B	Resistor R_B (discharge to threshold)	Ω
C	Timing capacitor	F
f	Astable frequency	1/s
t_H	Output high time 0.693(R_A + R_B)C	s
t_L	Output low time 0.693 R_B C	s
D	Duty cycle t_H/T	-
t_{mono}	Monostable pulse width 1.1 R_A C	s

Method and standards

RC timing of the 555.

Assumptions and limits

- Bipolar 555; ideal thresholds at ⅓ and ⅔ of the supply.

References

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Report details

Report reference	FCC-T71Q-M676 (the same inputs always give the same reference)
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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/electrical/electronics/timer-555-astable

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.