REVISION GUIDE

Reactance and Time Constant Revision Guide

A fuller printable guide to RC timing, capacitor energy, and capacitive or inductive reactance, with time-domain and frequency-domain ideas kept deliberately separate.

QUICK OVERVIEW

Category: electrical electronics

Includes 1 related guide page.

Links back to 4 calculator tools.

FORMULA HIGHLIGHTS

RC time constant
tau = R x C

Charging curve
V(t) = Vfinal x (1 - e^(-t / tau))

Capacitive reactance
Xc = 1 / (2 x pi x f x C)

Inductive reactance
Xl = 2 x pi x f x L

WHAT THIS PACK COVERS

This pack gathers together the most useful timing and reactance relationships so you can keep RC behaviour, stored energy, and AC opposition visible in one place without blending the ideas together.

CORE FORMULAS

- tau = R x C
- V(t) = Vfinal x (1 - e^(-t / tau))
- E = 0.5 x C x V^2
- Xc = 1 / (2 x pi x f x C)
- Xl = 2 x pi x f x L

TIME-DOMAIN REMINDERS

- One time constant is a characteristic step, not full completion.
- Five time constants is a common practical near-settled rule.
- Charging and discharging are exponential, not linear.

FREQUENCY-DOMAIN REMINDERS

- Capacitive reactance falls with frequency.
- Inductive reactance rises with frequency.
- There is no single AC opposition value without stating the frequency.

WORKED EXAMPLE: RC TIMING

With 100 kOhm and 10 microfarads, tau is 1 second and a practical near-settled estimate is around 5 seconds. That turns a component list into a timing expectation immediately.

WORKED EXAMPLE: REACTANCE

A 1 microfarad capacitor at 1 kHz has reactance of roughly 159 ohms. At 10 kHz the reactance drops by a factor of ten, which explains why the same component behaves differently across frequency.

COMMON MISTAKES

- Treating tau as full completion.
- Mixing microfarads and farads without conversion.
- Using reactance formulas without a clear frequency.
- Assuming ideal behaviour where parasitics and tolerance matter.