A family of waveforms

Not every signal looks like a sine. A flute, a snare drum and radio static all make sound, but each has a different waveform, and the signals inside a chip don't all share one shape either.

Four more shapes to know by sight

Shape	Where you'll meet it	What it looks like
Square	Digital clocks	Snaps between two levels, with nothing in between
Triangle	ADC ramps, test signals	Straight-line rise, straight-line fall
Pulse	Digital clocks with a tunable on-time (the **duty cycle**)	A square that spends more time low than high, or the other way round
Noise	Sensor readouts, the thermal noise floor	Never repeats, so it has no period at all

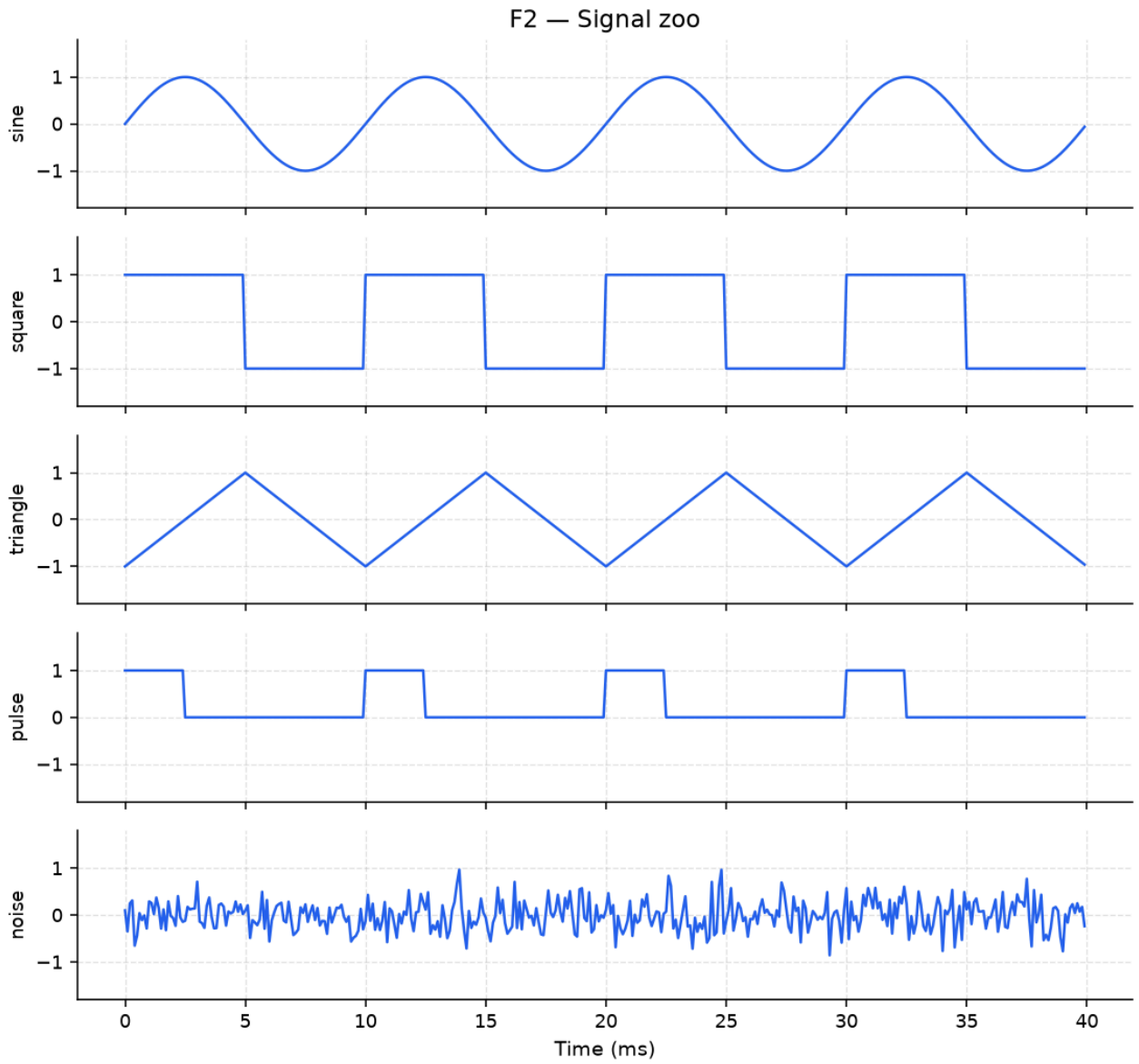


Figure 1: F2 — Signal zoo

The F2 explorer drives every shape from the same amplitude setting, and they still look completely different. That's why you can't judge a trace by its height alone: two waveforms can have the same height on a datasheet and still carry completely different information.

You can build the square, pulse and triangle from the same time array `t` you met on What is a signal?, using a phase that counts from 0 to 1 once per cycle. If you compare the phase to a threshold you get a square or a pulse, and if you ramp it up and then down you get a triangle. You'll build those three this way in Lab 01, Part 4, along with a noise trace, and the duty cycle comes back in Rhythm and duty cycle.

Why an engineer cares

- The clocks in a digital chip are square waves.
- The ramps an ADC uses are triangle waves.
- The noise trace is what the **thermal noise floor** looks like: the chip's own randomness, which sets the smallest signal the chip can resolve.

Next: Two voices in time