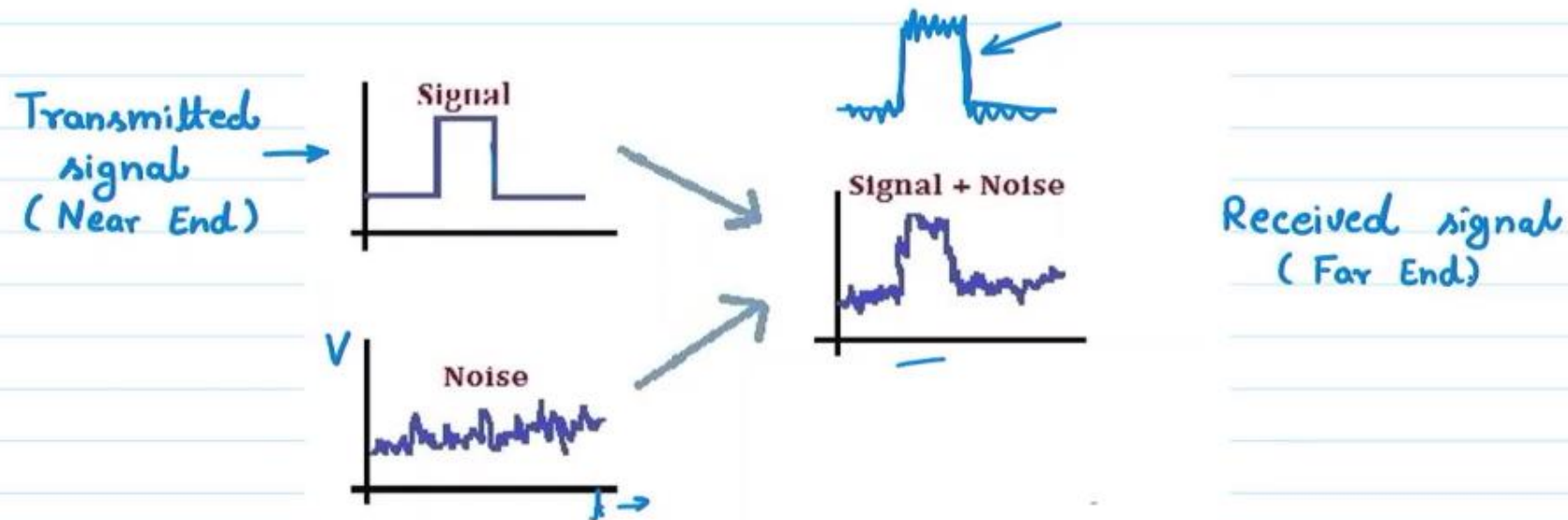


Signal Integrity :

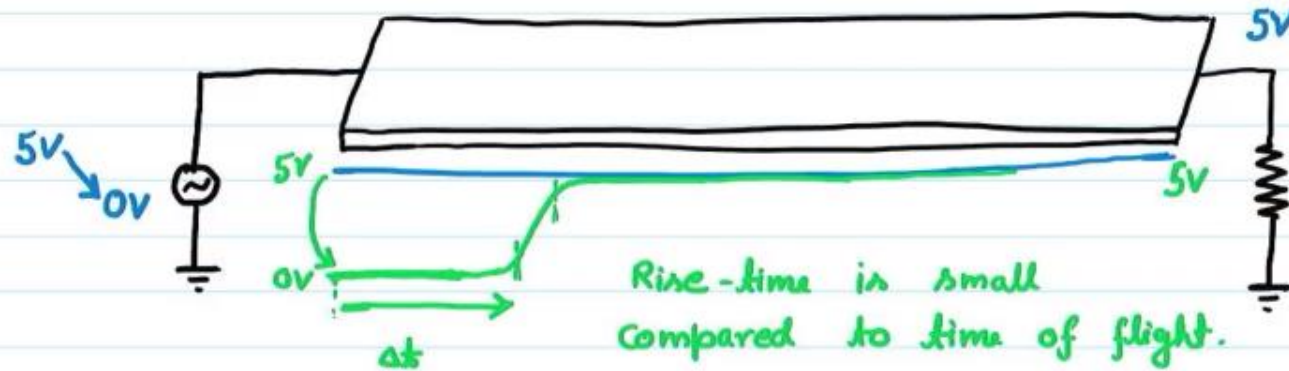
Signal Integrity (SI) signifies the signal's ability to propagate without distortion.

- SI issues must be taken care during the PCB design phase.
 - Once PCB is fabricated, very difficult to improve on SI.
- All signals are fundamentally analog in nature.



Signal Integrity issues :

The most important cause of signal integrity issues is a faster signal rise/fall times.



We can divide various signal integrity issues into following categories :

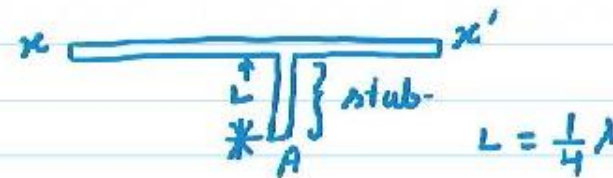
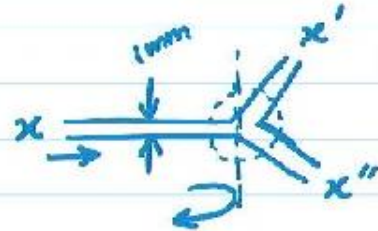
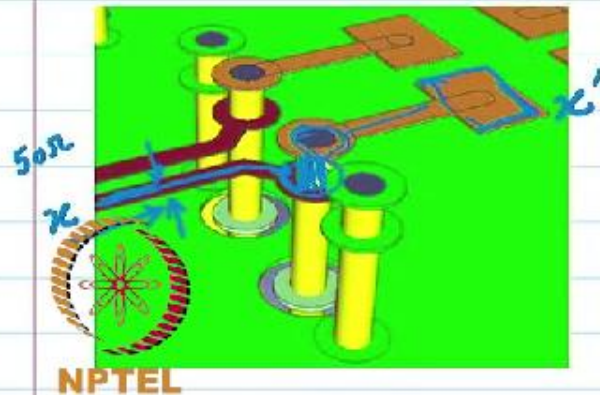
- 1) Impedance discontinuities.
- 2) Reflections , Ringing , Overshoot and Undershoots.
- 3) Crosstalk.
- 4) Via - stub
- 5) Skew and Jitter
- 6) Signal attenuation.
- 7) Ground Bounce
- 8) Power and GND distribution network.
- 9) EMI Noise .

Impedance Discontinuity :

If the signal encounters a discontinuity in impedance, it will suffer reflections.

This will happen when :

- 1) A signal encounters a via in its path.
- 2) A signal branches out into two or more lines.
- 3) A signal return path plane encounters a discontinuity.
- 4) Line stubs are connected and are $\frac{1}{4} \lambda$ of switching speed.
- 5) Signal and return paths are connected to connector pins.



Reflections , Ringing , Overshoot and Undershoot .

Whenever the impedance changes in a circuit , some amount of reflection will happen .

- When a signal is transmitted in a transmission line , some of the signal power may be reflected back to its transmitter rather than being carried all the way along the trace to the far-end .
- The reflected signal will travel back until it encounters another change in impedance and gets reflected again .

Influence of reflection :

- Signal Distortion .
- Overshoot / Undershoot .

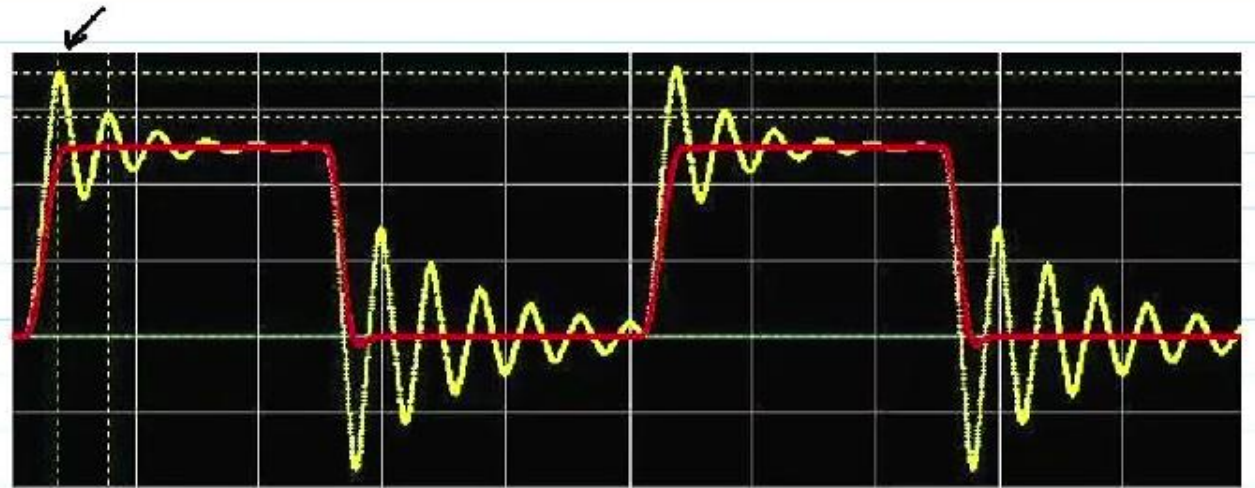
How to reduce :

- Maintain constant impedance .
- Good ground .
- Proper termination .

What is Ringing?

- Ringing is a voltage or current output that oscillates like a ripple.

Signal →



Overshoot:

When the value of transit signal is more than the actual value.

Undershoot:

When signal transits from higher value to lower value, and value of transit signal is less than actual signal.

