MetaStable State

Please send corrections (or suggestions) to youngwlim@hotmail.com.

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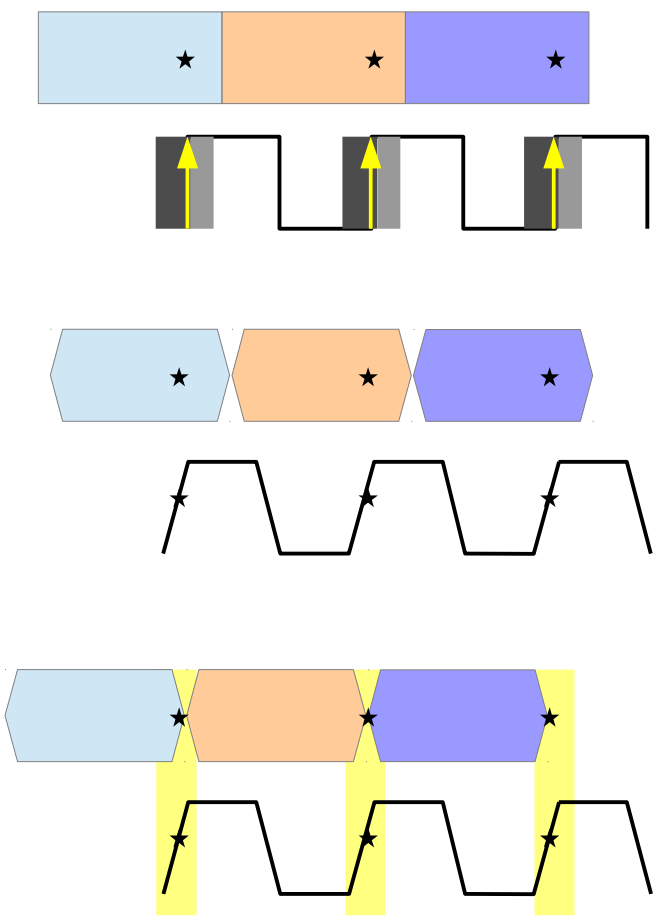
Metastability

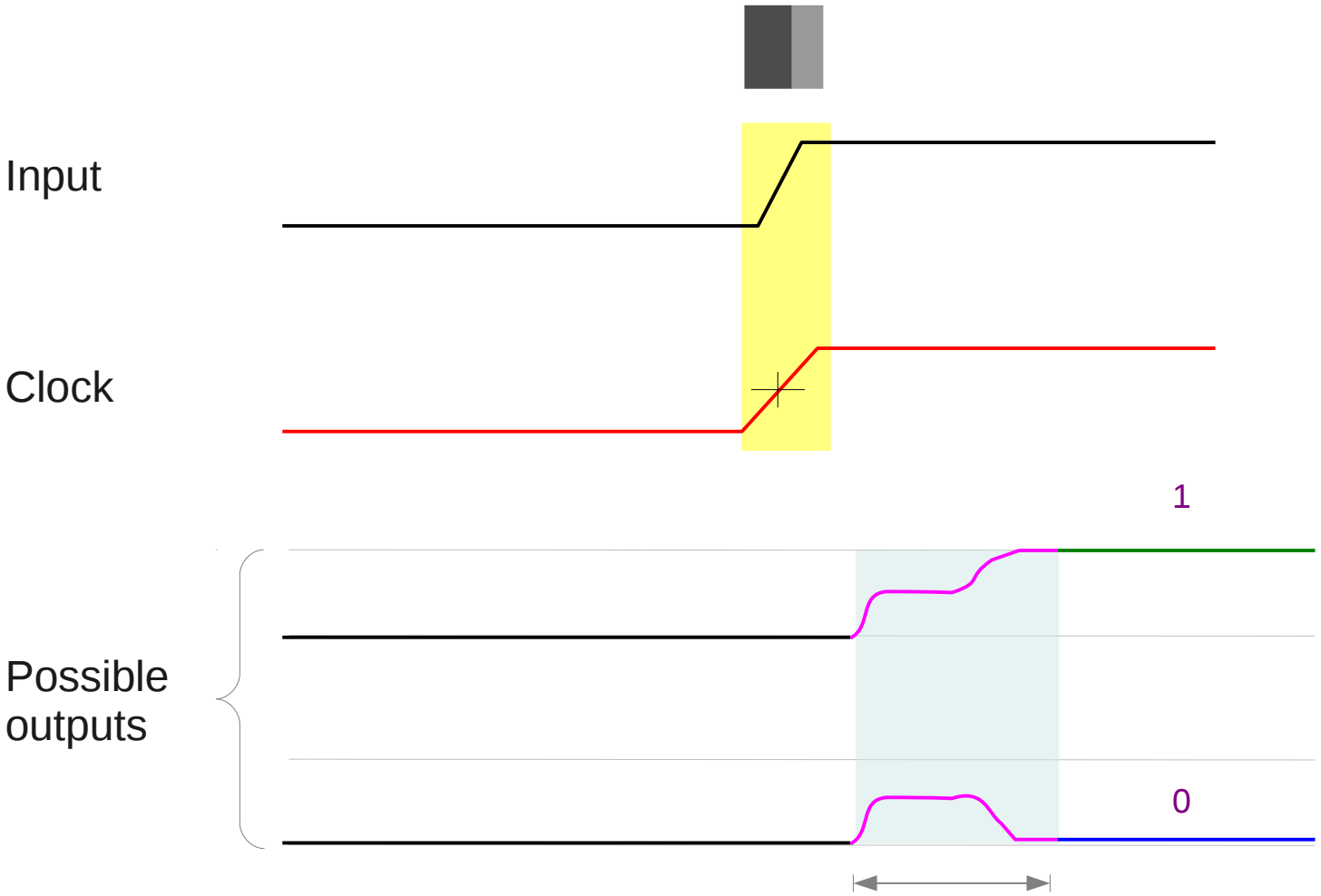
Metastability in electronics is the ability of a digital electronic system to persist for an unbounded time in an unstable equilibrium or metastable state.

In metastable states, the circuit may be unable to settle into a stable '0' or '1' logic level within the time required for proper circuit operation.

As a result, the circuit can act in unpredictable ways, and may lead to a system failure, sometimes referred to as a "glitch".

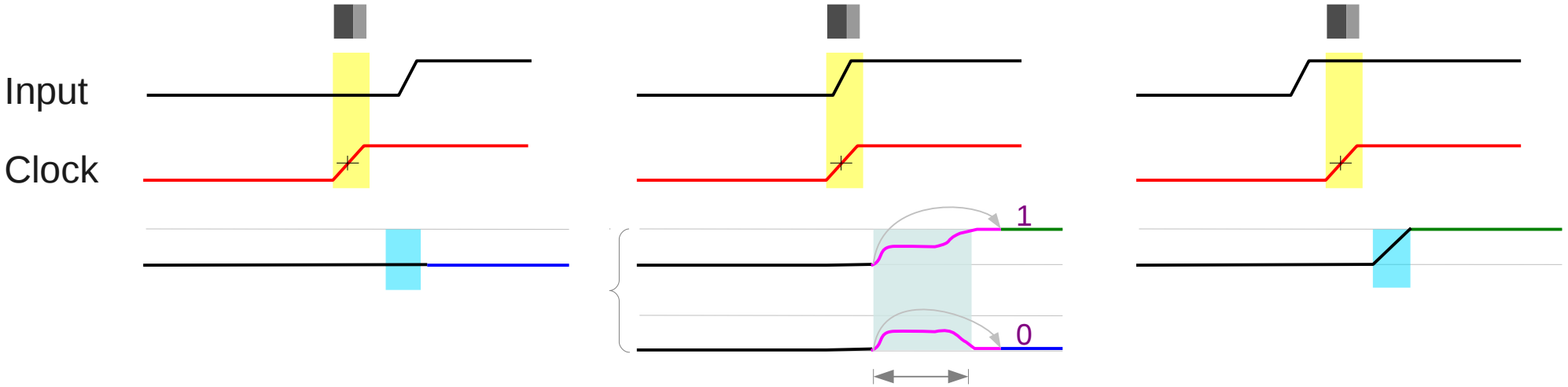


Possible Metastable Outputs



Metastability

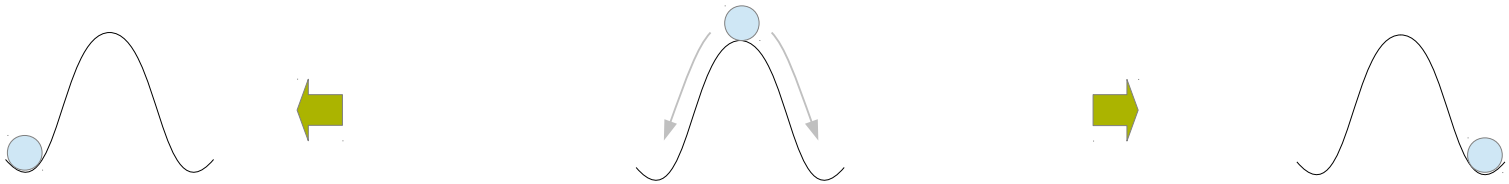
violation of setup
and hold time



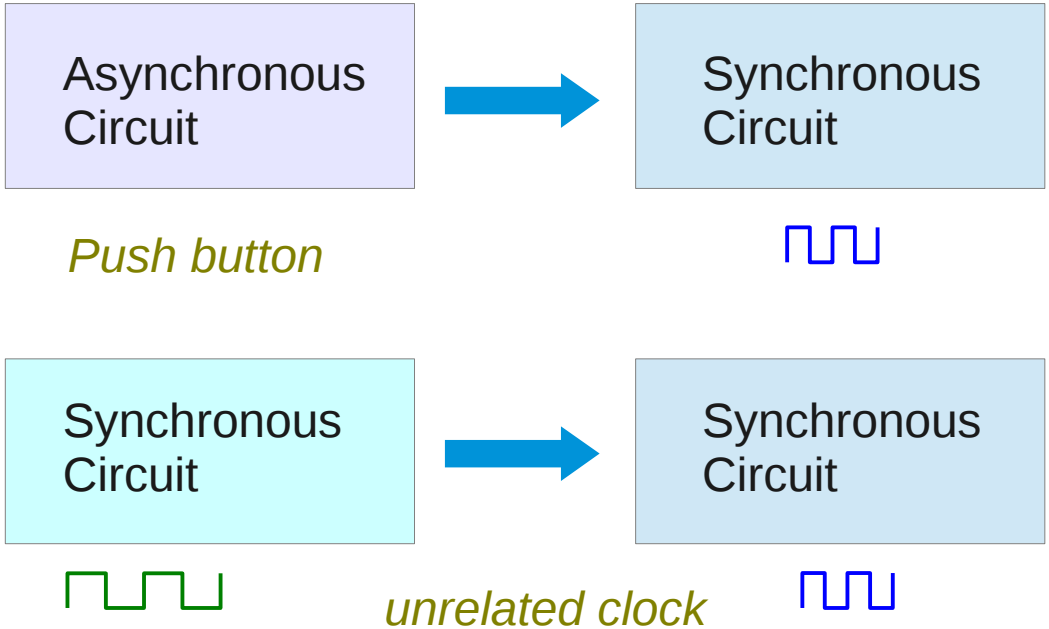
non-deterministic period

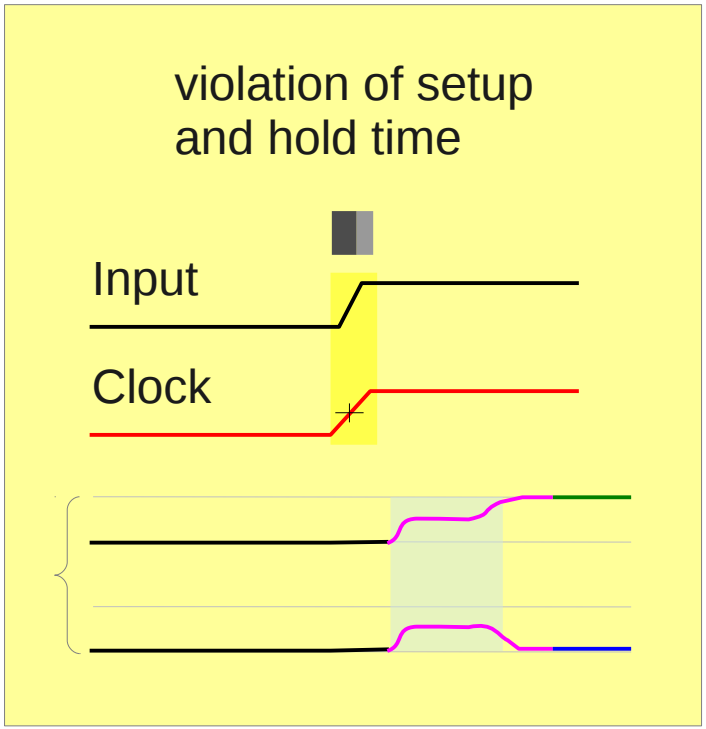
but longer than the normal
clock-to-output delay

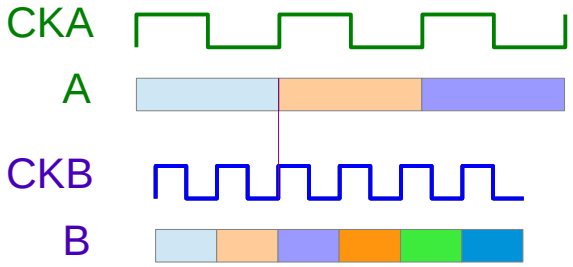
an electronic noise can
make either 0 or 1 state



Causes of Metastability







Resolution Time

References

[1] http://en.wikipedia.org/
[2] M. M. Mano, C. R. Kime, “Logic and Computer Design Fundamentals”, 4th ed.
[3] J. Stephenson, Understanding Metastability in FPGAs. Altera Corporation white paper. July 2009.