

# Resolution

---

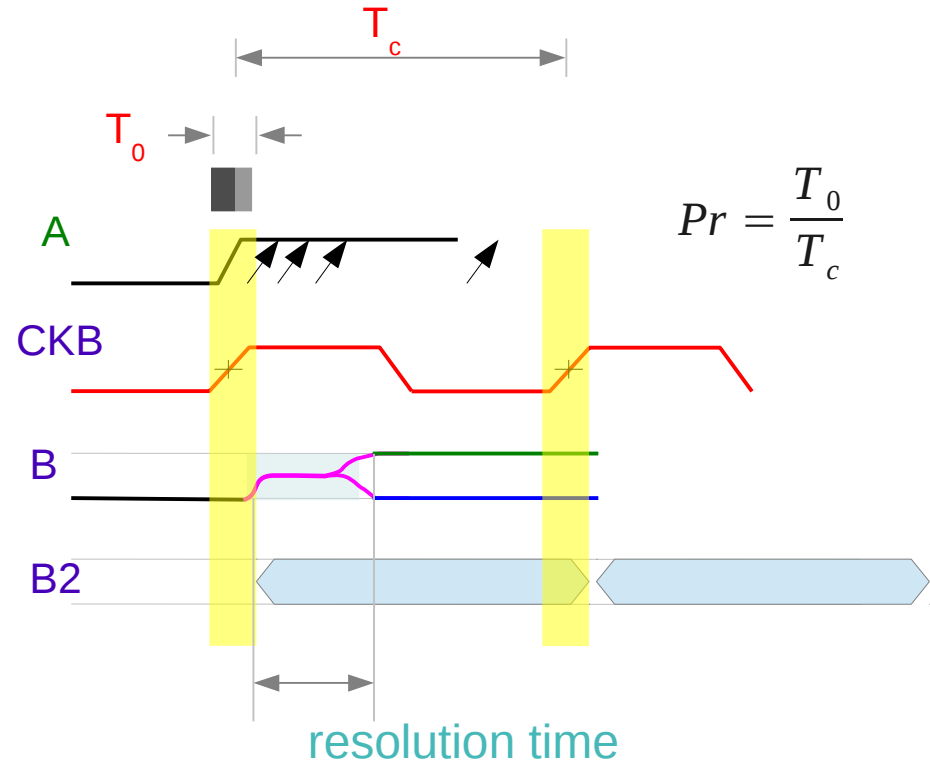
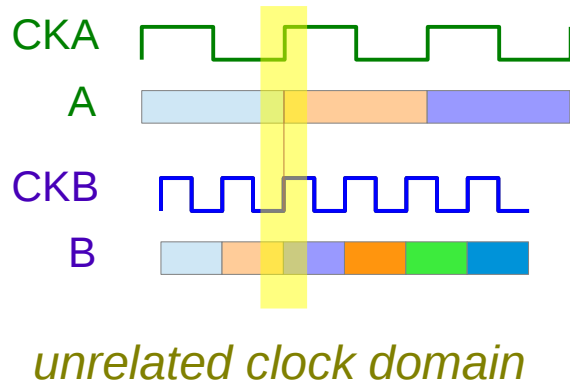
Copyright (c) 2011-2013 Young W. Lim.

Permission is granted to copy, distribute and/or modify this document under the terms of the GNU Free Documentation License, Version 1.2 or any later version published by the Free Software Foundation; with no Invariant Sections, no Front-Cover Texts, and no Back-Cover Texts. A copy of the license is included in the section entitled "GNU Free Documentation License".

Please send corrections (or suggestions) to [youngwlim@hotmail.com](mailto:youngwlim@hotmail.com).

This document was produced by using OpenOffice and Octave.

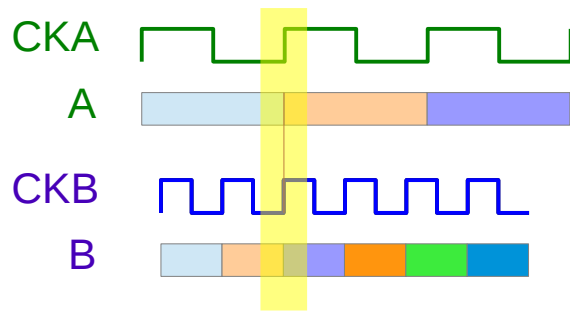
# Resolution Time



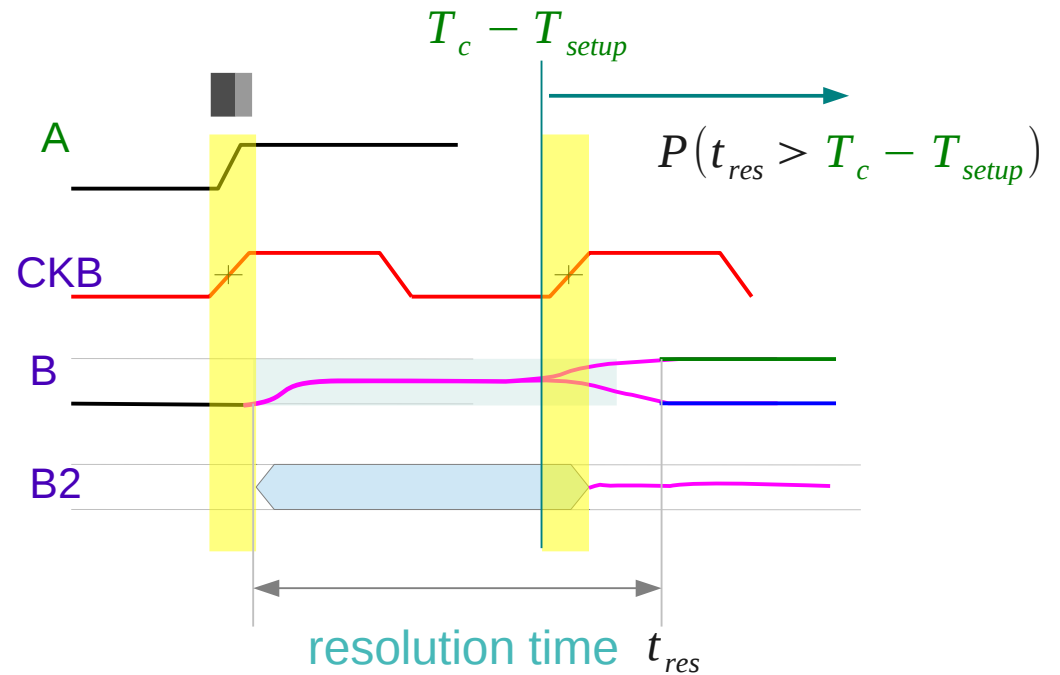
$$P(t_{res} > t) = \frac{T_0}{T_c} e^{-t/\tau}$$

$\tau$  time constant  
depending on a  
specific flip flop  
implementation

# P(failure)



*unrelated clock domain*

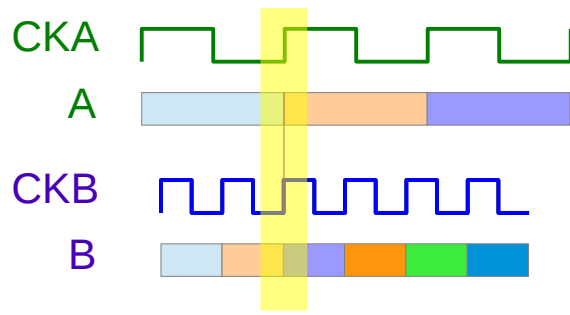


$$P(t_{res} > t) = \frac{T_0}{T_c} e^{-t/\tau}$$

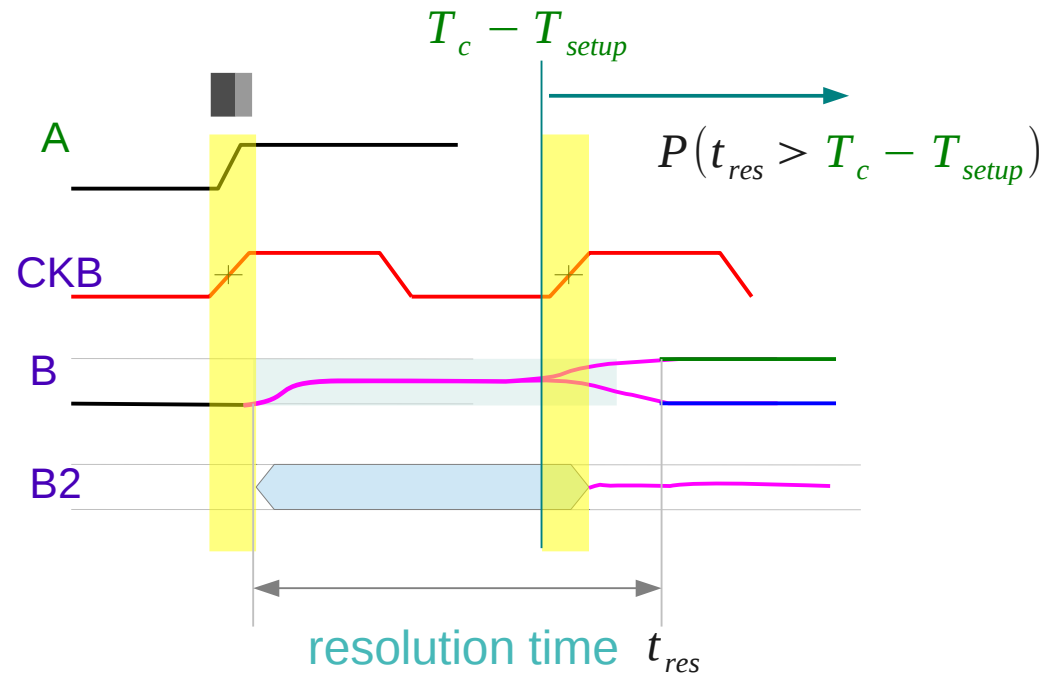
$$P(t_{res} > T_c - T_{setup}) = \frac{T_0}{T_c} e^{-(T_c - T_{setup})/\tau}$$

$$P(\text{failure}) = \frac{T_0}{T_c} e^{-(T_c - T_{setup})/\tau}$$

# Mean Time Between Failures



unrelated clock domain



$$P(t_{res} > t) = \frac{T_0}{T_c} e^{-t/\tau}$$

$$P(t_{res} > T_c - T_{setup}) = \frac{T_0}{T_c} e^{-(T_c - T_{setup})/\tau}$$

$$P(\text{failure}) = \frac{T_0}{T_c} e^{-(T_c - T_{setup})/\tau}$$

input A changes N times per second

$$\text{MTBF} = \frac{1}{P(\text{failure}) / \text{sec}}$$

$$= \frac{T_c}{N T_0} e^{+(T_c - T_{setup})/\tau}$$

# Resolution Time

---

## References

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