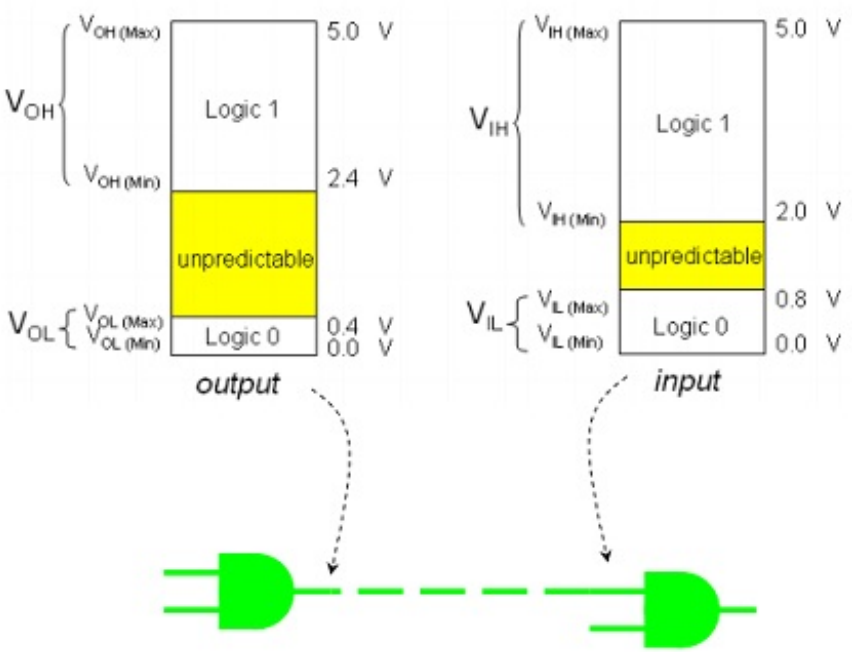
Gate Property Examples

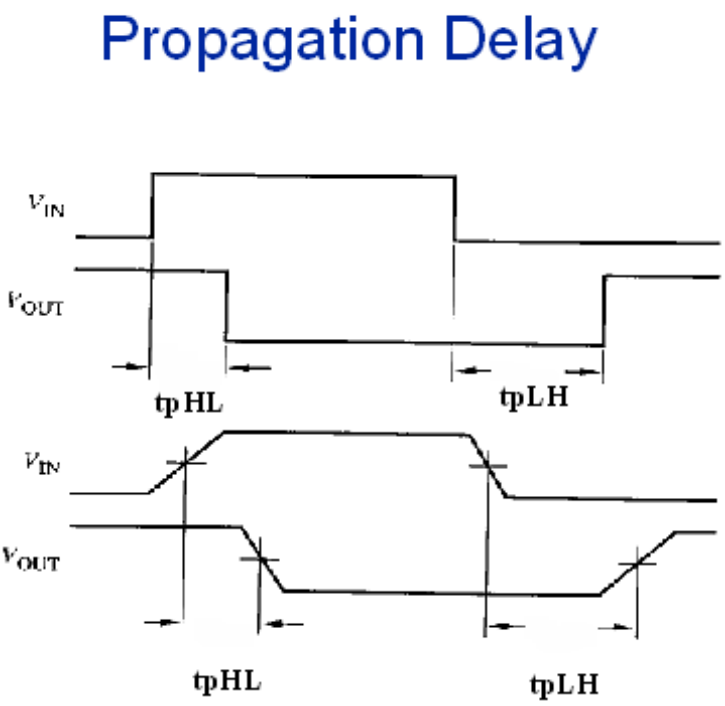
Here are some examples I thought might be helpful for you to review corresponding contents of the textbook. Please note that these examples are made by myself just for reference. You still need to review your textbook and lecture summaries carefully to get a fully understanding of these contents.

1.There are two TTL gates, whose input/output characteristics are shown in the picture below. Please calculate the worst case noise margins.



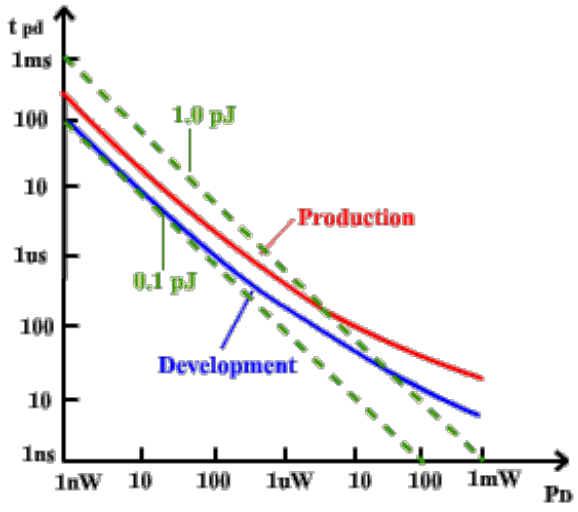
> Solution:
> Worst case high level noise margin = VOH(min) - VIH(min) = 2.4V- 2.0V = 0.4V
> Worst case high level noise margin = VIL(max) - VOL(max) = 0.8V - 0.4V = 0.4V

2.The timing of input and output of a gate is shown in the picture below, where tpHL = 2ms, tpLH = 3ms. Please calculate the average propagation delay time tpd.



Solution:
tpd = (tpHL + tpLH)/2 = 2.5ms

3.The delay-power-product curve of two gates are indicated in the picture below. Please explain which of the two gates (red line and blue line) are better in performance and why. (You don't have to consider other factors such as cost)



> Solution:
> The blue one is better. Because with the same power consumption, the blue one has less propagation delay; with the same propagation delay the blue one has less power consumption.

reference:
Fig 1: http://secure.tutorsglobe.com/CMSImages/1944_Image-4.jpg
Fig 2:
http://www.eecs.berkeley.edu/~newton/Classes/CS150sp98/lectures/week2_2/img005.gif
Fig 3: http://elearning.najah.edu/OldData/Courses/Course66321/Section0/DA_LOG/TTL/P-D-Product_graph1.gif