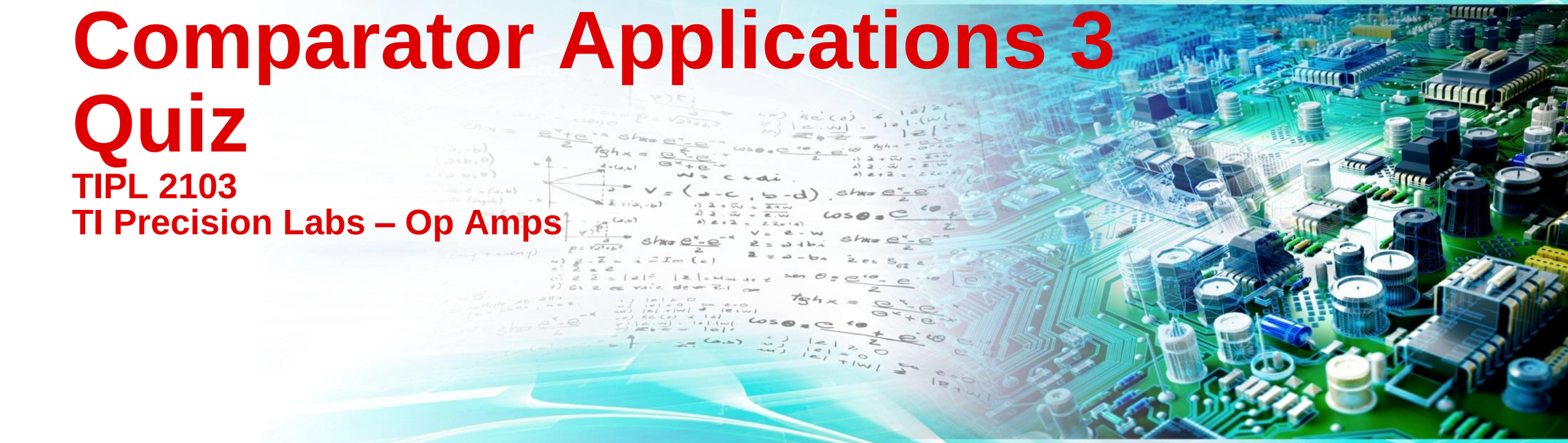
Comparator Applications 3 Quiz

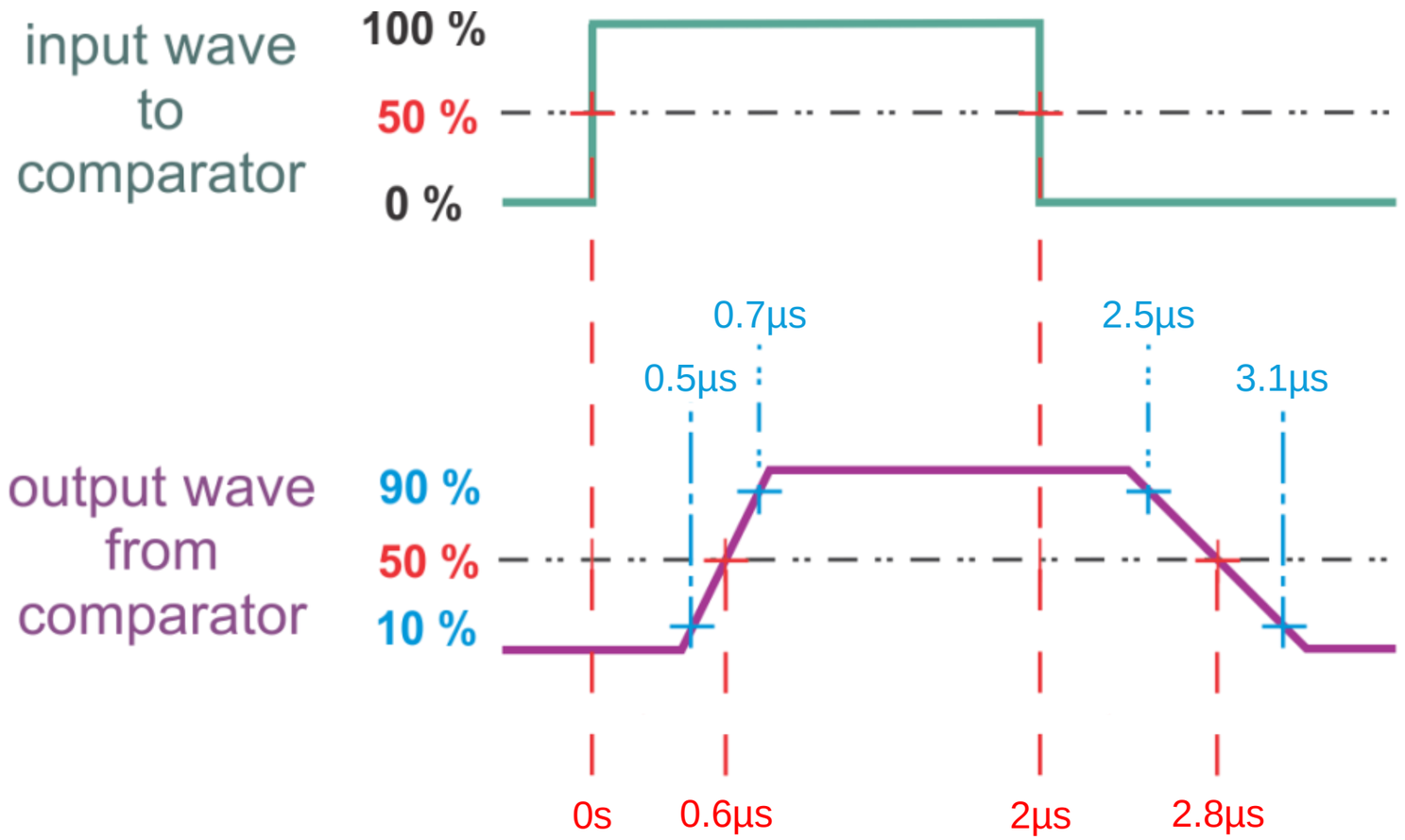
TIPL 2103

TI Precision Labs – Op Amps



Question 1

a) Use the information below to determine t_r, t_f, $t_{P(LH)}$ and $t_{P(HL)}$ for this comparator.
b) Calculate the maximum toggle frequency of this comparator using the answer of part a)



Multiple Choice

- Comparators can be used successfully with _____.
  a. Single power supplies only
  b. Dual/split power supplies only
  c. Both single and dual/split power supplies
  d. No power supply present

- A single supply, open collector comparator will _____ when the output is high and will _____ when the output is low.
  a. Source current; sink current
  b. Sink current; source current
  c. Neither source nor sink current; sink current
  d. Neither source nor sink current; source current

Multiple Choice

- Comparator start-up output state uncertainty means _____.
  a. A comparator may or may not turn on as power is applied
  b. The comparator output will always be high as power is applied
  c. The comparator output will always be low as power is applied
  d. The comparator output may transition back and forth between states as power is applied

- Comparator power-on-reset (POR) circuitry _____.
  a. Keeps the comparator output at a high impedance during start-up
  b. Forces the comparator output low during start-up
  c. Forces the comparator output high during start-up
  d. Forces the comparator output to the last known state during start-up

Multiple Choice

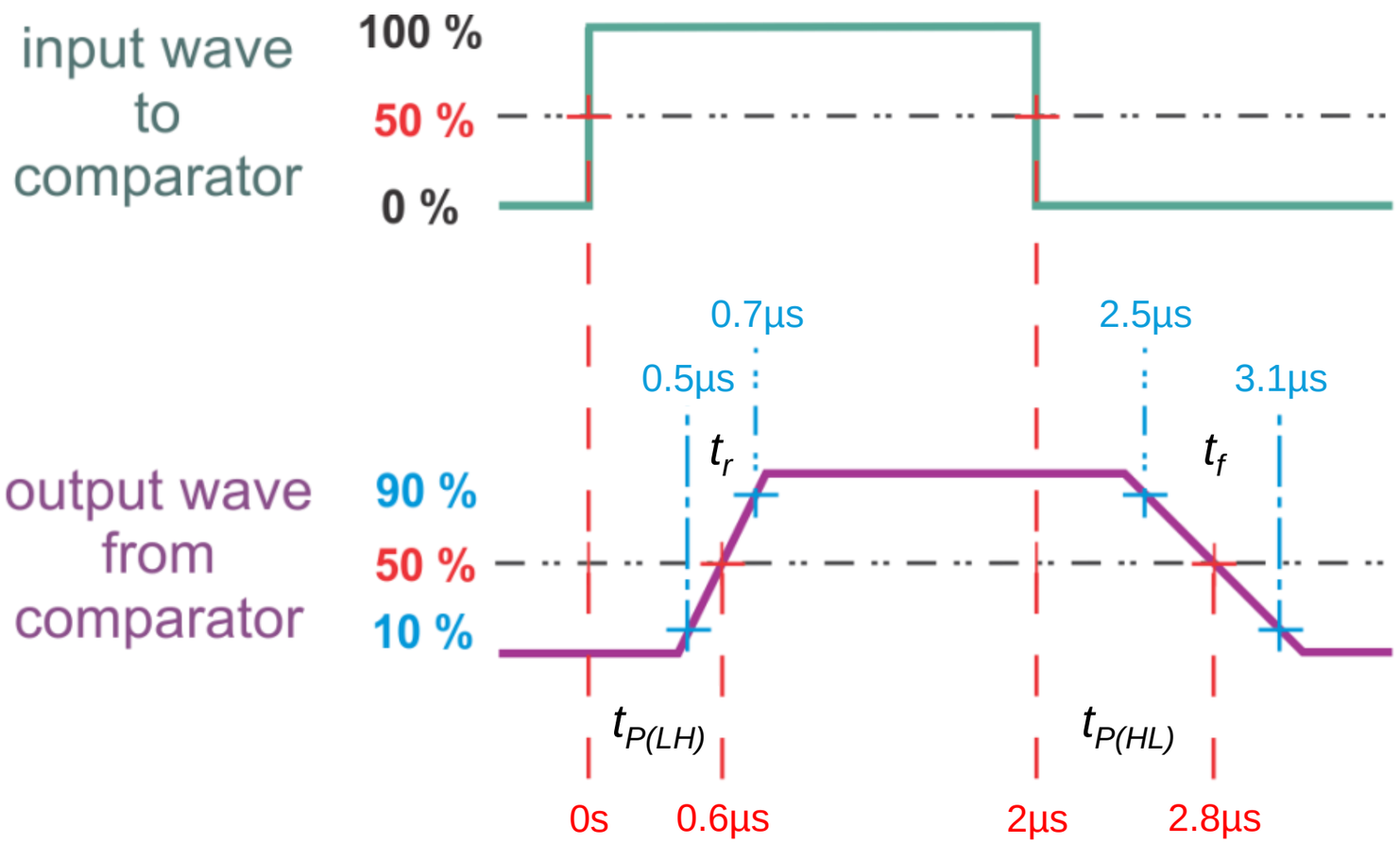
- Propagation delay is the time required for the comparator output to reach _____ of its final output level when the input changes to _____ of its final input level.
  a. 10%; 90%
  b. 50%; 50%
  c. 25%; 75%
  d. 100%; 100%

- Comparator maximum toggle frequency is based on _____.
  a. Rise time, fall time, and propagation delay
  b. Rise time, fall time, propagation delay, and start-up uncertainty
  c. Propagation delay, shoot-through current, and start-up uncertainty
  d. Rise time, fall time, shoot-through current, and start-up uncertainty

Solutions

Question 1 – Solution

a) Use the information below to determine t_r, t_f, $t_{P(LH)}$ and $t_{P(HL)}$ for this comparator.



- $t_r = 0.7\mu s - 0.5\mu s = \mathbf{0.2\mu s}$
- $t_f = 3.1\mu s - 2.5\mu s = \mathbf{0.6\mu s}$
- $t_{P(LH)} = 0.6\mu s - 0s = \mathbf{0.6\mu s}$
- $t_{P(HL)} = 2.8\mu s - 2\mu s = \mathbf{0.8\mu s}$

Question 1 – Solution

b) Calculate the maximum toggle frequency of this comparator using the answer of part a)

- t_r = 0.2µs
- t_f = 0.6µs
- $t_{P(LH)}$ = 0.6µs
- $t_{P(HL)}$ = 0.8µs

$$f_{toggle} \cong \left(t_r + t_f + t_{P(LH)} + t_{P(HL)}\right)^{-1}$$

$$f_{toggle} \cong (0.2\ \mu s + 0.6\ \mu s + 0.6\ \mu s + 0.8 \mu s)^{-1} = \mathbf{454.5\ kHz}$$

Multiple Choice – Solutions

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