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Fuzzy Production Rules on Estimations of Buck DC-DC Power Converter Parameters

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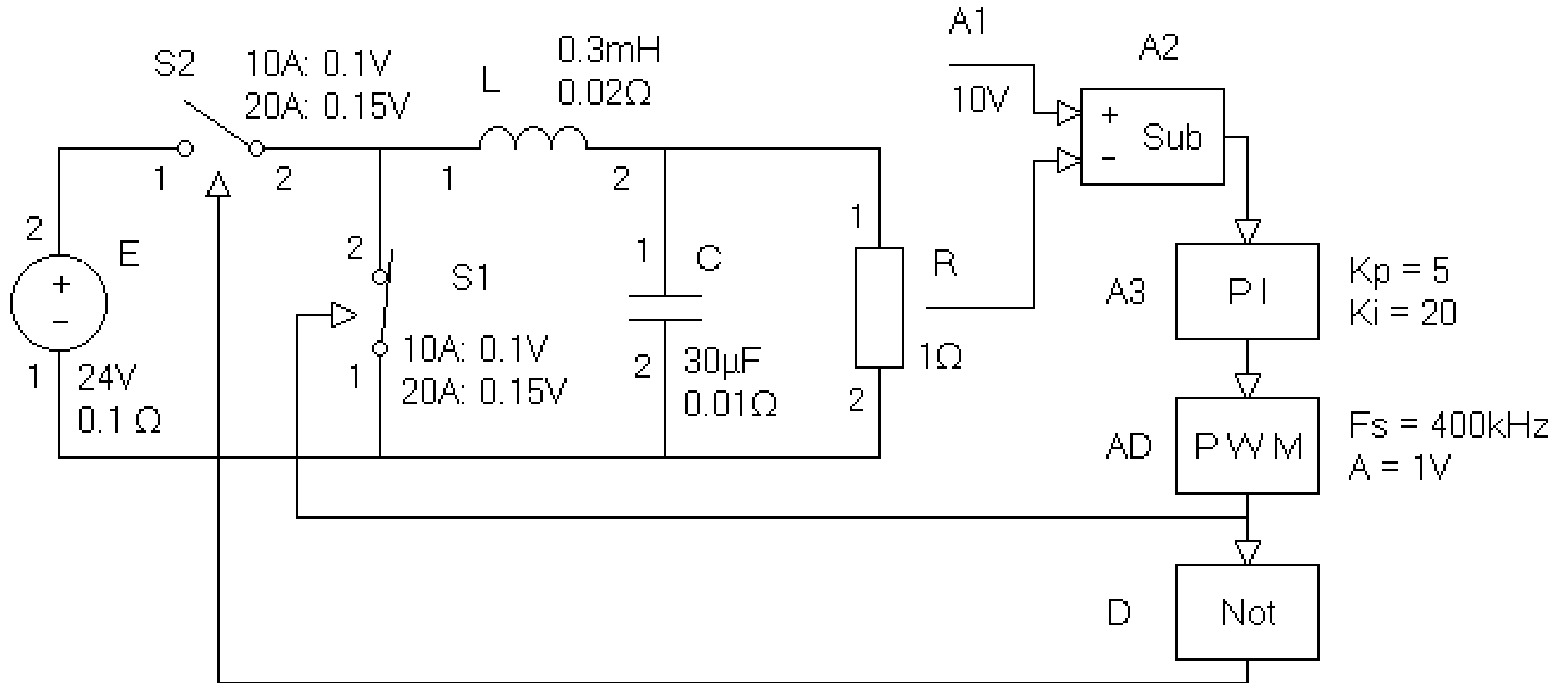
Fuzzy production rules

IF U_1 is A_1 AND U_2 is A_2 AND ...
AND U_n is A_n THEN V is B

IF U_1 is A_1 AND U_2 is A_2 AND ...
AND U_n is A_n THEN V is B (μ)

μ - certainty degree of the rule

Buck DC-DC Power Converter



Buck DC-DC Power Converter Parameters (1)

$$E = 24 \text{ V} \pm 25 \%$$

$$[0.75 \text{ Par}, 0.85 \text{ Par}] : 0.1 ;$$

$$L = 300 \text{ } \mu\text{H} \pm 25 \%$$

$$[0.85 \text{ Par}, 0.95 \text{ Par}] : 0.4 ;$$

$$C = 30 \text{ } \mu\text{F} \pm 25 \%$$

$$[0.95 \text{ Par}, 1.05 \text{ Par}] : 1 ;$$

$$K_p = 5 \pm 25 \%$$

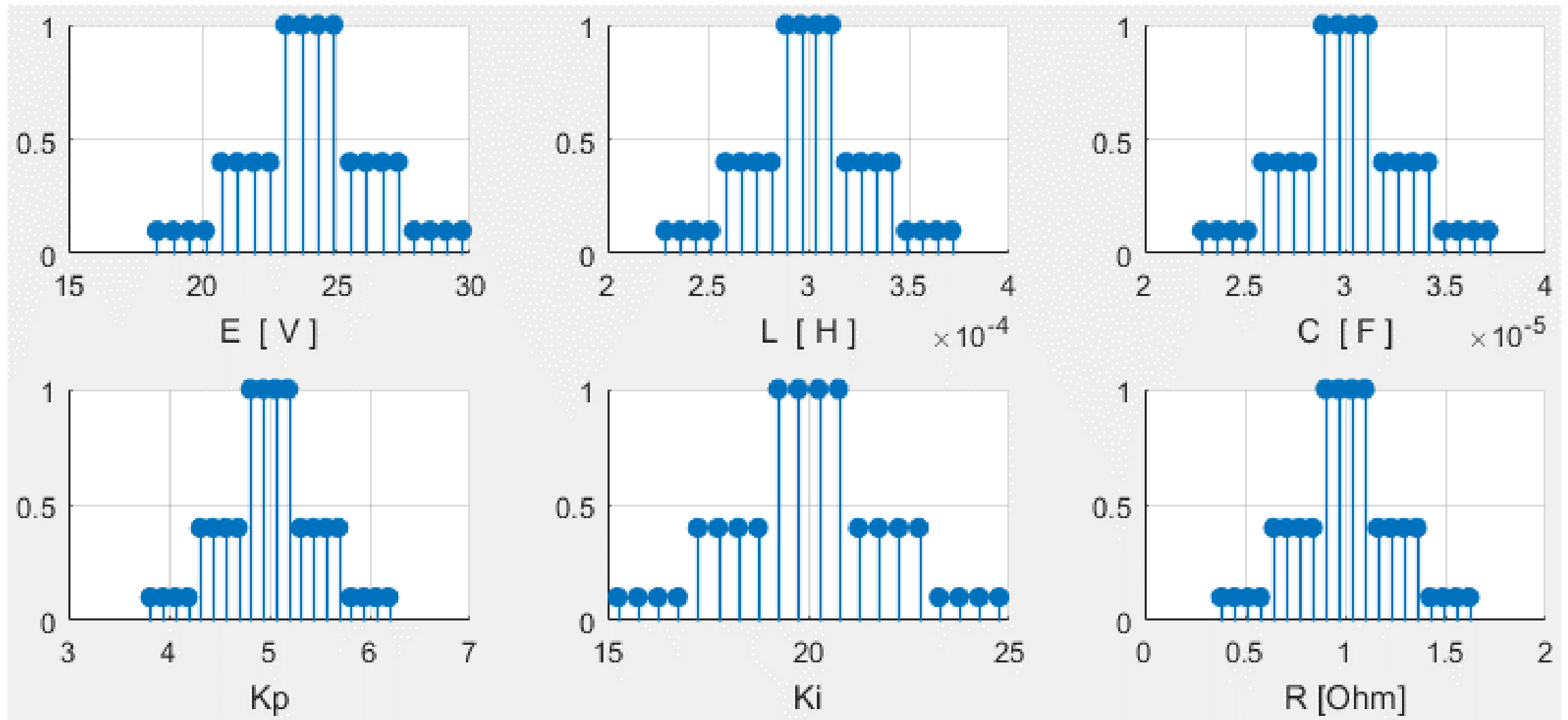
$$[1.05 \text{ Par}, 1.15 \text{ Par}] : 0.4 ;$$

$$K_i = 20 \pm 25 \%$$

$$[1.15 \text{ Par}, 1.25 \text{ Par}] : 0.1 ;$$

$$\text{Par} \in \{E, L, C, K_p, K_i\}.$$

Buck DC-DC Power Converter Parameters (2)



Buck DC-DC Power Converter Parameters (3)

$$R = 1 \Omega \pm 65 \%$$

$$[0.35 \Omega, 0.61 \Omega] ;$$

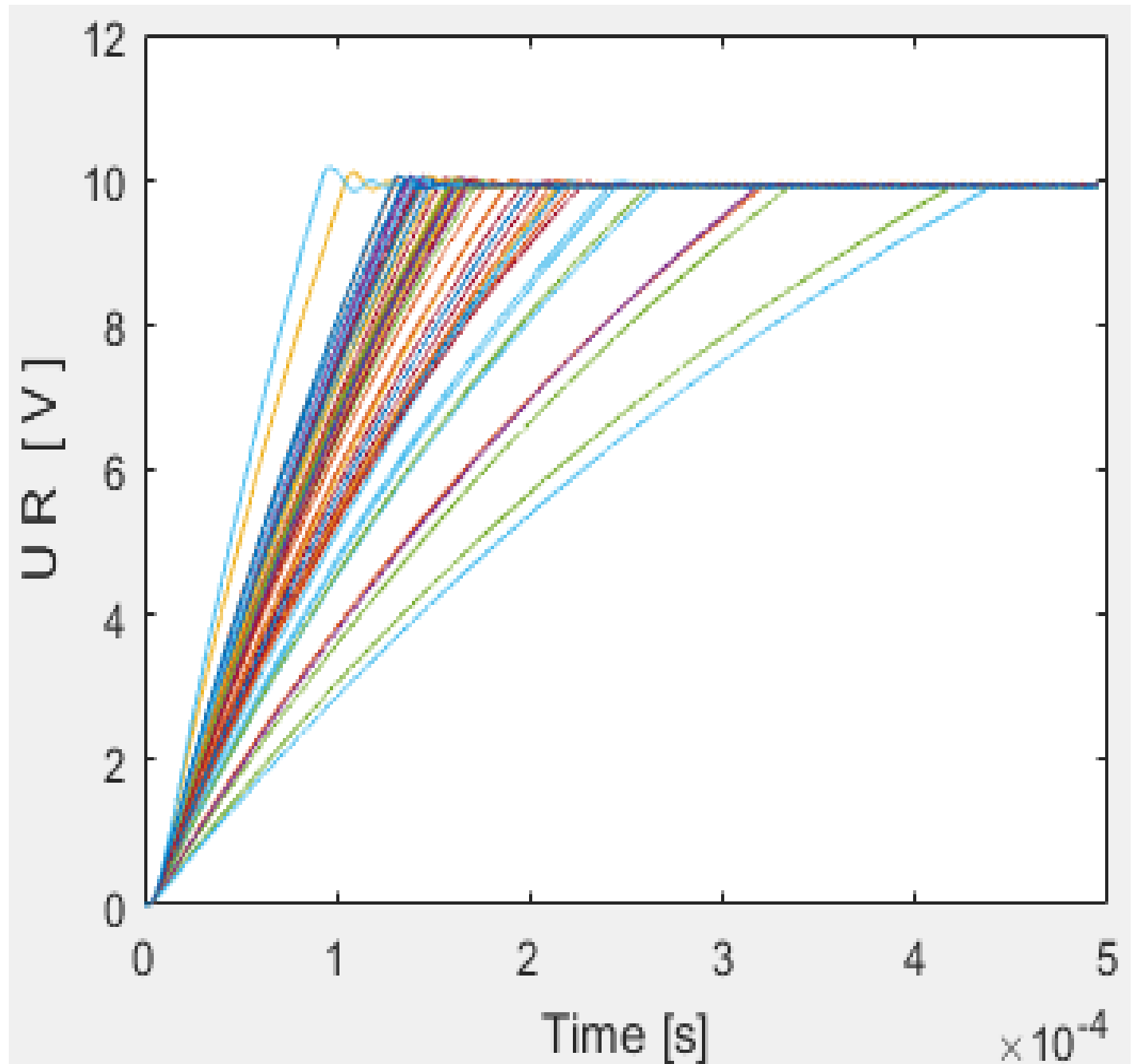
$$[0.61 \Omega, 0.87 \Omega] ;$$

$$[0.87 \Omega, 1.13 \Omega] ;$$

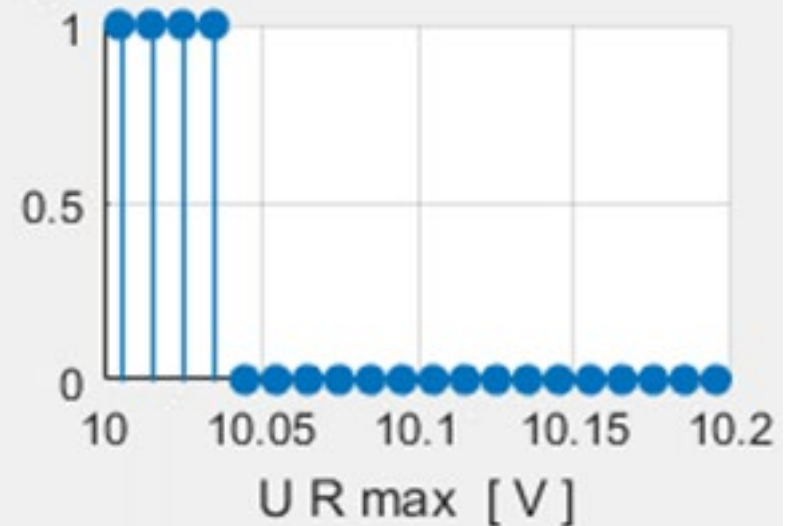
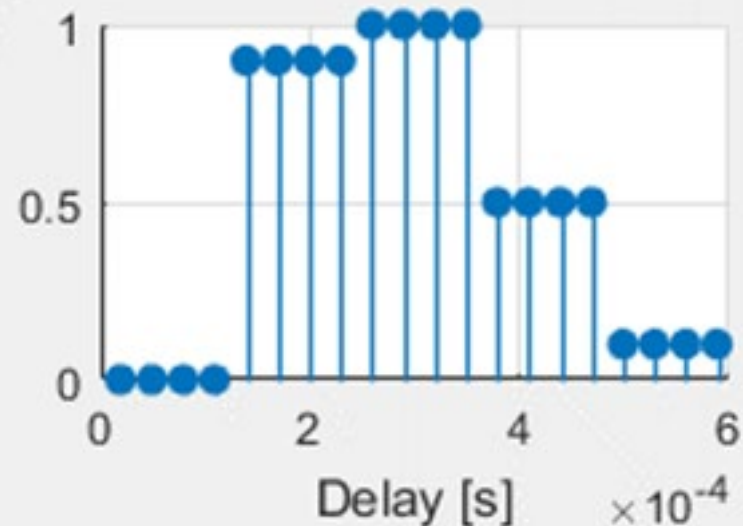
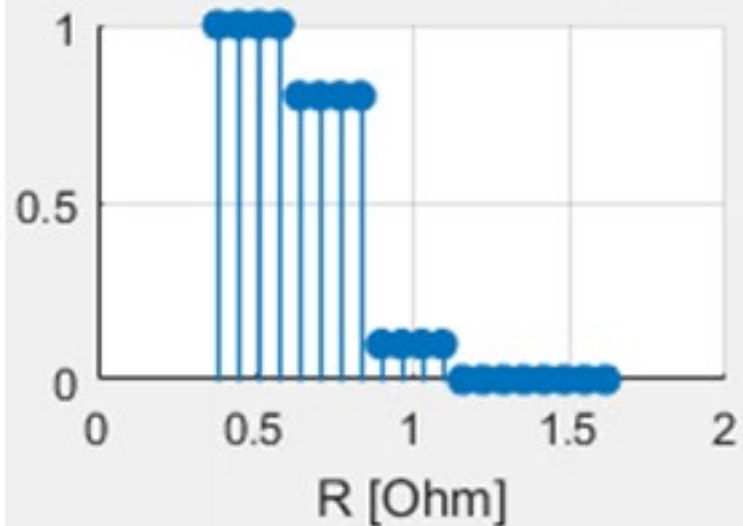
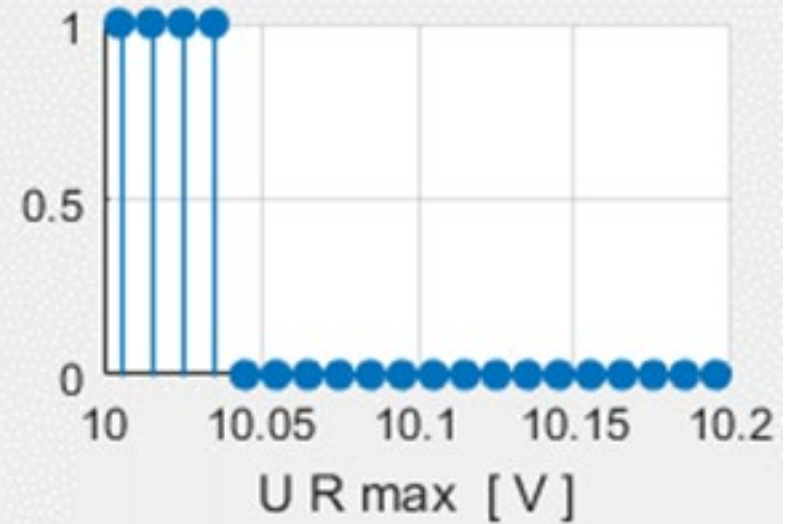
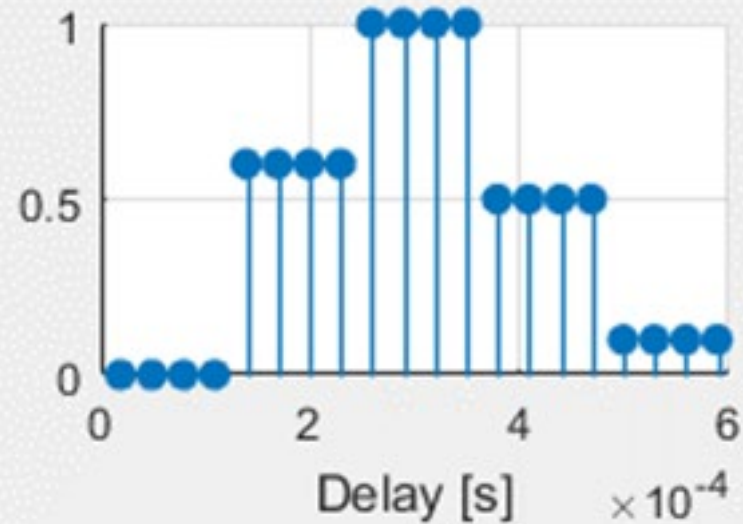
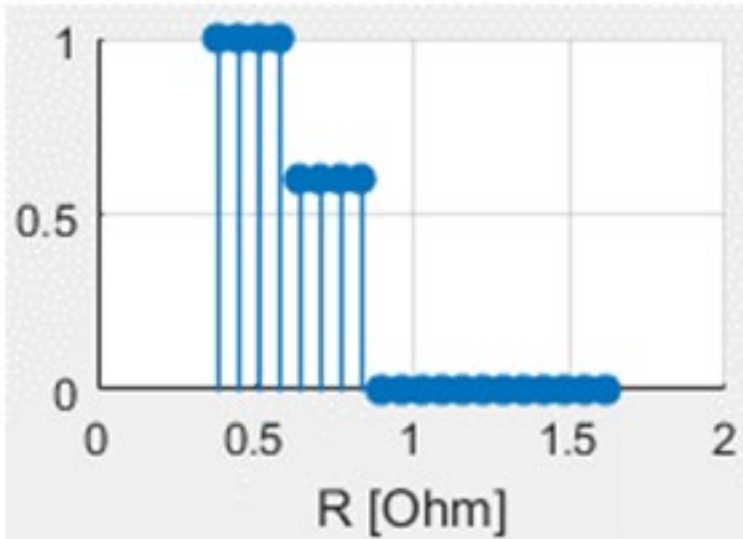
$$[1.13 \Omega, 1.39 \Omega] ;$$

$$[1.39 \Omega, 1.65 \Omega] .$$

Output voltage characteristics



In case of low values of R



In case of high values of R

