

عنوان مقاله:

Time-domain Analysis of Traveling Wave Switches based on Time-variant Transmission Line Model

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نویسندگان:

H. Khoshniyat - *Electrical Engineering Department, Arak University of Technology, Arak, Iran*

G. Moradi - *Department of Electrical Engineering, Amirkabir University of Technology, Tehran, Iran*

A. Abdipour - *Department of Electrical Engineering, Amirkabir University of Technology, Tehran, Iran*

خلاصه مقاله:

Background and Objectives: Switches play an important role in controlling the signal flow in telecommunication systems. The traveling wave switch structure is introduced based on active transmission lines. By applying the gate voltage (V_g), the transfer of signal through the drain transmission line is controlled. By increasing operating frequency, lumped model is unreliable and semi and fully distributed modeling should be applied for the analysis of these elements. **Methods:** Traveling wave switches can be analyzed based on the lossy transmission line model, in linear and non-linear modes in the time and frequency domains. The study of transient behavior and time domain response of switch is very important. Switching and transient from on to off state and vice versa affect the performance of telecommunication systems. In the proposed method, the switch is modeled as the lossy transmission line that the primary elements of this model change with time based on the control voltage applied to the gate and are considered as variable with time. The structure is discretized in the space and time domains with Δz and Δt steps. The Finite-difference time-domain (FDTD) method is utilized to study the transient response of switches. By using the leap-frog algorithm, the new voltages and currents of the transmission line are calculated based on the values of adjacent spatial and temporal steps. **Results:** The transient response of the switch is analyzed in transition from off to on states and vice versa, for the $800\mu\text{m}$ switch at 60GHz , based on the parameters of the passive transmission line and nonlinear Curtice² FET model. **Conclusion:** For transient analysis of the structure, the time-variant lossy transmission line model was used that its elements changed based on the applied control voltage. The results of FDTD method were investigated with the transient analysis of commercial software that show good agreement with each other and validated the proposed method.

کلمات کلیدی:

Finite-difference time-domain (FDTD) method, Fully-distributed model, Lossy transmission line model, Single Pole (Single Throw (SPST), Traveling wave switch (TWSW)

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