Properties of an Ideal Switch:

When the switch is closed, a fundamental property asserts that V1 is equal to V2, ensuring seamless connectivity within the circuit. This aligns with the ideal switch having zero ON resistance (Ron), signifying minimal resistance when the switch is in the ON state. Alternatively, when the switch is open, it functions as an open circuit, preventing the flow of current. This behavior corresponds to the ideal switch having infinite OFF resistance (Roff), symbolizing an impassable barrier to current in the OFF state. Third, the ideal switch exhibits bidirectional operation, accommodating the flow of current in both directions [2]. Lastly, it has a range of unlimited voltages for V1 and V2, providing adaptability to a variety of voltage conditions within the circuit.

Quantitative Measures of Switch Non-Idealities:

When we talk about how switches work in real life, there are a few things we can measure to see if they're doing a good job or not. One thing is the resistance when the switch is on (ON Resistance - Ron). If there's any resistance, even a little, it means the switch isn't perfect. Similarly, when the switch is off, we look at the OFF Resistance (Roff). If there's some resistance, especially if it's not very high, it means the switch isn't ideal. Additional factors influence the efficiency of a circuit. These include the presence of leakage current when the switch is in the OFF state and a forward voltage drop when it is ON. The assessment of conductivity involves measuring on-state resistance, and power loss is experienced during both conduction and switching [1]. The calculation of power loss requires measurements of voltage and current differences. Another thing to check is the Voltage Drop when ON (V_switch). If there's any drop in voltage when the switch is on, it's a sign of not-so-ideal behavior. We also look at whether there's any difference between the voltages on both sides of the switch when it's on (Asymmetry in V1 and V2 when ON). Ideally, they should be the same. Lastly, we check how quickly the switch goes from on to off (Switching Time - t_switch). If there's any noticeable delay, it means the switch isn't working perfectly.

References:

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