# Project 2 Research

Vraj Patel
400434795
patev61

## Ideal Switch Properties

The fundamental properties of an ideal switch are integral to the reliable operation of electronic circuits. Initially, two core attributes underscore the ideal switch concept: ensuring that when the switch is closed, V1 equals V2, and when open, the circuit is in an open state. These principles, ingrained in courses like 1E03 and 2CI3, set the foundation for an ideal switch. To accomplish these foundational properties, the switch must also possess zero resistance in the closed state and infinite resistance in the open state, encapsulated in properties 3 and 4.  Subsequently, these characteristics pave the way for additional essential properties. Property 5 dictates that an ideal switch should exhibit no power dissipation in either the open or closed state, aligning with the principles of zero voltage drop and zero current flow. Property 6 mandates the absence of reactive behaviors, excluding capacitance and inductance, emphasizing the ideal switch's capacity to neither draw current from the circuit nor impose voltage. Finally, Property 7 emphasizes a direct change in state, eschewing any transient or instantaneous states, ensuring a clear transition between ON and OFF states. Together, these properties constitute a comprehensive framework for an ideal switch, showcasing its prowess in adhering to key electrical principles and fostering efficient and reliable circuit operations.

## Quantitative Measures of Non-Ideality.

In the realm of practical engineering, the realization of an ideal switch remains elusive within our imperfect world. Consequently, it becomes imperative to establish meaningful and quantitative methodologies for assessing the non-idealities associated with each characteristic of the ideal switch. For instance, in gauging the non-ideality of Property 2, an insightful measure involves evaluating the magnitude of leakage current under specific applied voltage. This measure efficiently discerns whether the current is ideally zero or exhibits a slight deviation from perfection. Similarly, concerning Property 1, a pertinent measure entails evaluating the voltage drop across the closed switch when a specified current flows through it. Extending this approach to encompass the remaining properties, quantitative measures encompass assessing the resistance across the switch in both ON and OFF states for Properties 3 and 4. Property 5 involves measuring power across the switch under specific applied voltage and current conditions. Furthermore, Property 6 necessitates quantifying inductance or capacitance under applied voltage and current, while Property 7 mandates the measurement of voltage transitions between the ON and OFF states utilizing an oscilloscope. Adopting these quantitative measures is essential for the meticulous evaluation of real-world switches and their adherence to ideal switch properties.

# Project 2 Research

Vraj Patel
400434795
patev61