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Course

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Generating Design Concepts for the Power Usage Monitoring System

The design concepts for the power usage monitoring system should be based on the basic components of a simple power monitor. Focusing on different components will fundamentally result in different designs. The design specifications of the power monitoring system fundamentally rely on the different components of the system and their functions.

Power monitoring systems where an Analog-Digital Converter assesses the supply voltage must operate with the limitation that the ADC reference is lower than the supply voltage. In such cases, resistor dividers are necessary to convert the supply voltage into the range of the ADC reference voltage. A power monitoring system primarily consists of a load circuit, level shifter, integrator, OpAmp circuit, difference amplifier, and quantizer. The design, therefore, revolves around the relationship between the different elements constituting it.

The different elements of the circuit have different functions, such as the load circuit essentially representing the electrical application using the power. At the same time, the level shifter focuses on altering any violations of the common mode utilized by the OpAmp. The power monitoring system fundamentally focuses on changes in the power instead of the absolute power; hence, it has a difference amplifier that is utilized in digitizing the voltage from the integrator with the help of the quantizer. Power monitoring can essentially explore a design that shows the ADC power or the supply voltage from the integrator. Therefore, the different design concepts for the power monitoring system differ based on whether it has a

resistor-divider and a voltage measured. However, there are other determinants of the design concepts, such as the magnitude of the load voltage.

The power monitoring system essentially aims to identify the power consumption of digital circuits by the direct assessment of supply voltage through an ADC. Therefore, the design of the circuitry of the power management system depends on several issues. However, the design for the power management system can be viewed as a whole with consideration given to ergonomics, safety, and maintenance. The design for the final prototype should essentially focus on effectively accommodating the circuitry design with limited leakage. Moreover, the prototype's size is crucial, as consumers will easily be put off by a bulky design. The prototype should essentially be small and portable enough to ensure that the consumers can use it with their different devices, such as when charging laptops or phones.

Safety fundamentally demands that the prototype focuses on utilizing particular materials in the design. For instance, the wires in the circuitry should be clad in poor conductors to protect the consumers from electrocution. Furthermore, the prototype should undergo rigorous testing to ensure that it does not react explosively with high load voltages. Moreover, the prototype should establish the limits within which the system is safe and effective. Generally, the recorded limits should have a high safety factor to ensure that the prototype is safe even when the consumer violates the prescribed limits. Another critical element of the prototype design is its versatility, as it needs to work for different appliances ranging from refrigerators to phones. Finally, the materials used should be cheap to ensure that the price is affordable. Essentially, the design of the power monitoring system relies on the design of its circuitry and the needs of the consumers.