

Brief Summary of the Idea

A scaling buffer circuit for sensing a high DC input voltage is shown. The circuit can be used with a power converter controller.

The scaling buffer circuit scales the high DC input voltage from a higher value to a lower value which is then sensed by a line voltage sense terminal of the power converter controller. Therefore, less power is consumed by the power converter controller.

A single scaling buffer circuit can be used to connect multiple controllers to sense the high input DC voltage.

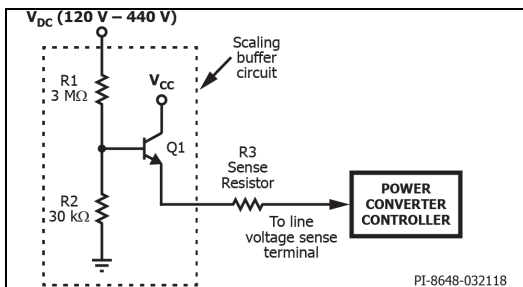


Figure 1. Scaling Buffer for a Single Controller.

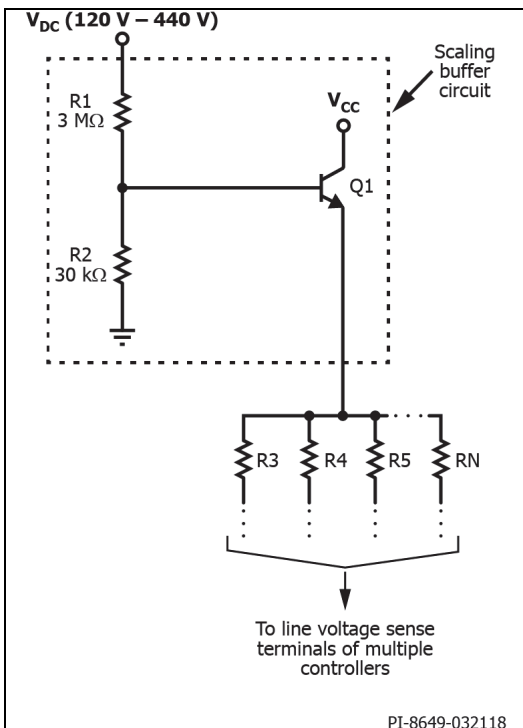


Figure 2. Scaling Buffer for a Single Controller.

Description

A power converter controller in high voltage systems typically senses a full-wave rectified ac input voltage which is a high DC input voltage of approximately 120 V to 440 V.

The power converter controller typically senses the high DC input voltage via a sense resistor connected to a line voltage sense terminal.

An example power converter controller having a line voltage sense terminal and a sense resistor (R3) is shown in Figure 1.

The scaling buffer circuit as shown in Figure 1 (exemplified as a resistor R1, a resistor R2, and a transistor Q1) can be connected between the sense resistor (R3) and the high DC input voltage V_{DC} (120 V – 440 V). As can be seen from Figure 1, one end of the scaling buffer circuit is connected to the high DC voltage input voltage V_{DC} (120 V – 440 V) and the other end of the scaling buffer is connected to the line voltage sense terminal of the power converter controller via the sense resistor R3.

The resistors R1 and R2 scale the high DC input voltage V_{DC} (120 V – 440 V) to a lower value which is then connected to the base of the transistor Q1. The scaling factor can be determined by the values of the resistors R1 and R2. The transistor Q1 functions as a buffer. Thus, the line voltage sense terminal senses the DC voltage V_{CC} , which is typically much lower in value than the DC input voltage V_{DC} .

The circuit shown in Figure 1, consumes lower power than a circuit in which the line voltage sense terminal directly senses the high DC input voltage because the current into the line voltage sense terminal comes from the supply voltage V_{CC} , which is much lower than V_{DC} . Therefore, this circuit provides less reduction in efficiency compared to a circuit where the high DC input voltage is sensed directly.

Figure 2 illustrates a circuit configuration for multiple controllers. As shown in Figure 2, the scaling buffer circuit (exemplified as resistor R1, resistor R2, and the transistor Q1) is connected between the high DC input voltage V_{DC} and the line voltage sense terminal of each of the N multiple controllers via the sense resistors (R3, R4, R5 up to RN).

The resistors R1 (3 MΩ) and R2 (30 kΩ) are biasing resistors. The transistor Q1 is a BJT NPN transistor. The values of biasing resistors may vary depending on the transistor used.