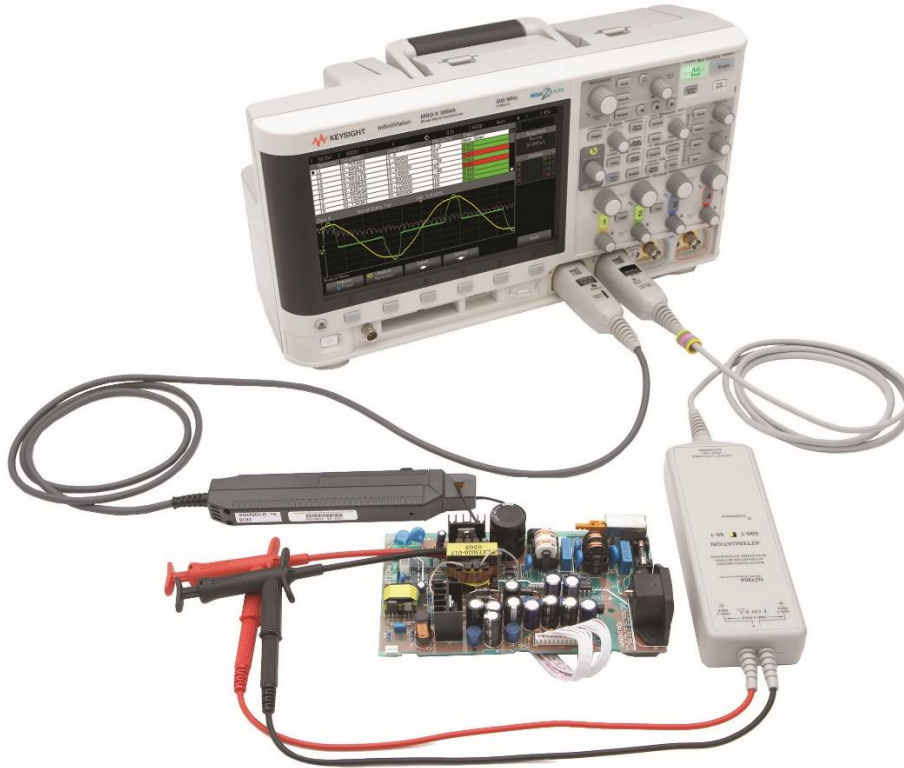


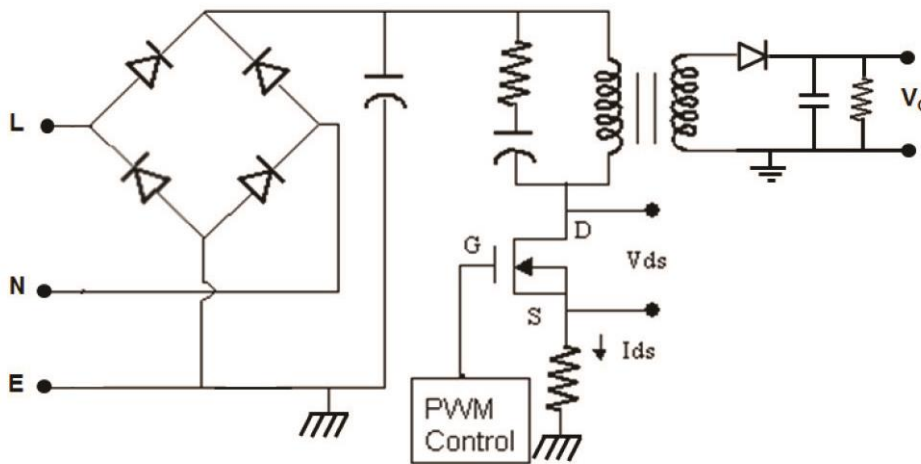
# Testing and Characterizing Power Supplies with Oscilloscope

The Keysight Technologies, Inc. InfiniiVision 3000, 4000 and 6000 X- Series oscilloscopes with the Power Measurements option provide various automatic power supply characterization measurements that can help accelerate your ability to optimize the quality and efficiency of your power supply designs.



Today's power supply designers are facing an increasing number of constraints in the development of high efficiency, low-cost power supplies. Cost-effective solutions used to be the designer's key target. Today, rising energy costs bring power supply efficiency to the forefront. Additionally, other constraints such as design compactness, migration to digital control, tighter voltage tolerances, and industry compliance regulations for power quality, current harmonics, and EMI force the need for quick and thorough power supply testing. Increasing design constraints translate into more time dedicated to power device measurement and analysis for today's power supply designers.

Figure 1 shows a simplified schematic of a switch-mode-power-supply (SMPS), which is commonly called a "switching power supply." In spite of the increasing analysis capability offered by many oscilloscopes in recent years, it is not uncommon to see designers perform measurements and analysis manually on a power supply such as this. Performing voltage, current, and power measurements at various points within the power supply typically takes a considerable amount of time to capture, analyze and report if performed manually. However, many of today's mid-range and higher-performance oscilloscopes offer power measurement options that can be used to automate these important power measurements.



**Figure 1.** Simplified schematic of a switch mode power supply (SMPS)

Figure 2 shows a Keysight InfiniiVision X-Series oscilloscope performing a series of input quality measurements including real, apparent, and reactive power. Also included are power factor (real/apparent), voltage crest factor, current crest factor, and phase angle. Setting up an oscilloscope to perform all of these measurements manually would be very time consuming.

Another important power supply measurement that is often performed on switch mode power supplies is power and energy loss of the switching transistor. Minimizing losses will maximize efficiency. Figure 3 shows a switching loss measurement over one switching cycle using a Keysight InfiniiVision X-Series oscilloscope.

Although this document has shown just two examples of typical power measurements that may be required, there are many other important power supply characterization measurements that can be performed automatically with the options available on Keysight's oscilloscopes. To learn more about these various power measurements, download [How to Make the Best Switch Mode Power Supply Measurements \(publication number 5991-1117EN\)](#).



Figure 2. Automatic input power quality measurements performed by a Keysight oscilloscope



Figure 3. Automatic power and energy switching loss measurement performed by a Keysight oscilloscope

# Keysight's InfiniiVision X-Series oscilloscopes

If you are in the market today to purchase your next oscilloscope to test your latest power supply design, Keysight Technologies' InfiniiVision X-Series oscilloscopes come in various bandwidth models ranging from 70 MHz to 1.5 GHz. Available in the InfiniiVision 3000, 4000 and 6000 X-Series are various measurement options including the Power Measurements option (DSOX3PWR, DSOX4PWR and DSOX-6PWR). These oscilloscopes also come with a 2-year recommended calibration cycle.

Also available from Keysight are a wide range of differential voltage and current probes for power supply measurements.

To learn more about Keysight's InfiniiVision X-Series oscilloscopes for power supply measurement applications, visit [www.keysight.com/find/InfiniiVision](http://www.keysight.com/find/InfiniiVision).



For more information on Keysight Technologies' products, applications, or services, please visit: [www.keysight.com](http://www.keysight.com)



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